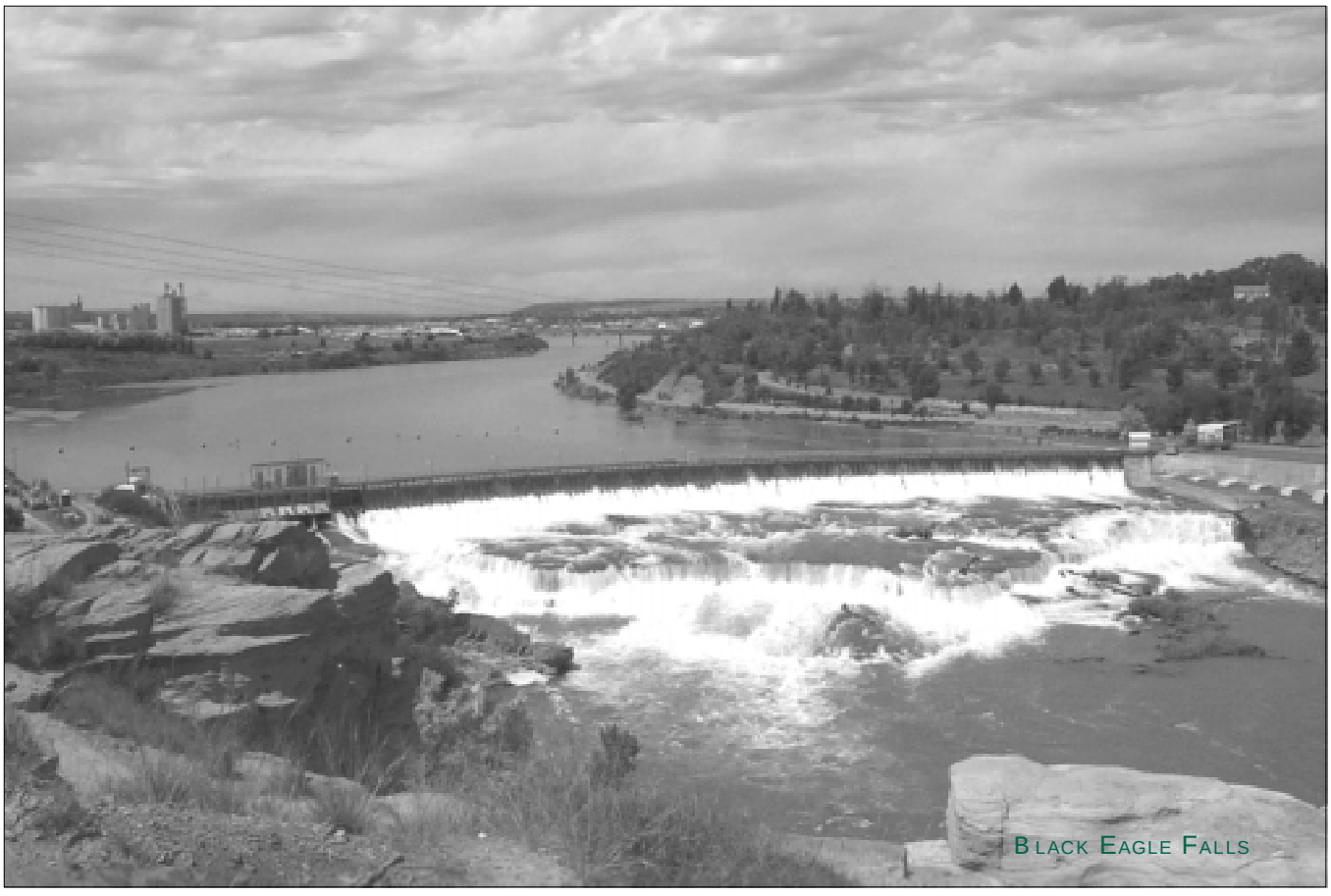
5TH ANNUAL MISSOURI RIVER NATURAL RESOURCES CONFERENCE

2001: A Missouri River Odyssey

PROGRAM

June 24-27, 2001
Great Falls, Montana
Best Western Heritage Inn



Black Eagle Falls

5TH ANNUAL MISSOURI RIVER NATURAL RESOURCES CONFERENCE
2001: A Missouri River Odyssey

Conference Sponsors

American Rivers • Blackfeet Tribe • Bureau of Land Management
Chippewa Cree Tribe • Fort Belknap Indian Community • Fort Peck Tribes
Lewis and Clark Trail Heritage Foundation • Missouri River Basin Association
Missouri River Citizens • Missouri River Natural Resources Committee
Montana Department of Environmental Quality
Montana Department of Fish, Wildlife, and Parks • PPL-Montana
U.S. Environmental Protection Agency • U.S. Fish and Wildlife Service
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Native American Cultural Fair sponsored by the Montana Tribal Tourism Alliance
in cooperation with
Connie Jacobs
Montana Department of Fish, Wildlife and Parks

Additional financial support provided by
Bureau of Land Management
Environmental Protection Agency, Region 7
Western Area Power Administration
PPL-Montana

Welcome to Big Sky Country!

The Missouri River is many things to many people.

The Missouri River is a source of economic, political and spiritual power. Her wildlife provides recreational opportunities, yet many native species in the drainage are threatened with extinction. The river defines political boundaries that separate us more than our communal dependence upon her unites us. The anniversary of the Corps of Discovery has put the focus on her history, but the river will play a large role in the future of the region.

Most of us view the river from a narrow personal perspective, putting us at odds with those whose views differ from ours. The conference will provide thought-provoking information from virtually every perspective found along the river on a wide range of topics. It is our hope that we will all leave the conference with a broader understanding of how to share the river.

If we are successful, the river and all of us that depend upon her will benefit.

Chris Hunter
Montana Department of Fish, Wildlife, and Parks
Helena, Montana

Annual changes in Missouri River water flow are obvious at Black Eagle Falls. Compare this picture of June 2000 with the one on the cover from June 1999.

Conference Steering Committee

Chris Hunter, 2001 Chairman
Montana Department of Fish, Wildlife, and Parks • Helena, MT

Mark Albers • American Rivers • Great Falls, MT
Ted Anderson • Western Area Power Administration • Billings, MT
Aart Dolman • Missouri River Citizens • Great Falls, MT
Steve Henry • U.S. Fish and Wildlife Service • Lewistown, MT
Jeanne Heuser • U.S. Geological Survey • Columbia, MO
Richard Hopkins • Bureau of Land Management • Great Falls, MT
Jon Jourdannais • PPL-Montana • Butte, MT
Mark Laustrup • U.S. Geological Survey • Columbia, MO
Mike LeValley • Missouri River Natural Resources Committee • Missouri Valley, IA
Carole Mackin • Montana Department of Environmental Quality • Helena, MT
Deb Madison • Fort Peck Tribes • Poplar, MT
Dave Mari • Bureau of Land Management • Lewistown, MT
Darrell Martin • Ft. Belknap Indian Community • Harlem, MT
Raymond Montoya • Blackfeet Tribe • Browning, MT
Jeffrey Olson • Lewis and Clark Trail Heritage Foundation • Bismarck, ND
Richard Opper • Missouri River Basin Association • Lewistown, MT
Greg Power • North Dakota Game and Fish Department • Bismarck, ND
Ayn Schmit • U.S. Environmental Protection Agency, Region 8 • Denver, CO
Videl Stump, Sr. • Chippewa Cree Tribe • Box Elder, MT
R.J. Young • Fort Peck Tribes • Poplar, MT

Program Contents

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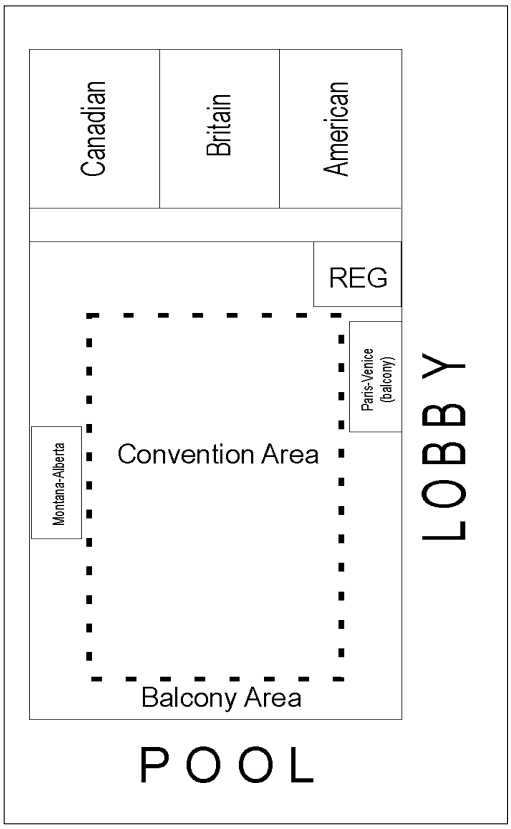
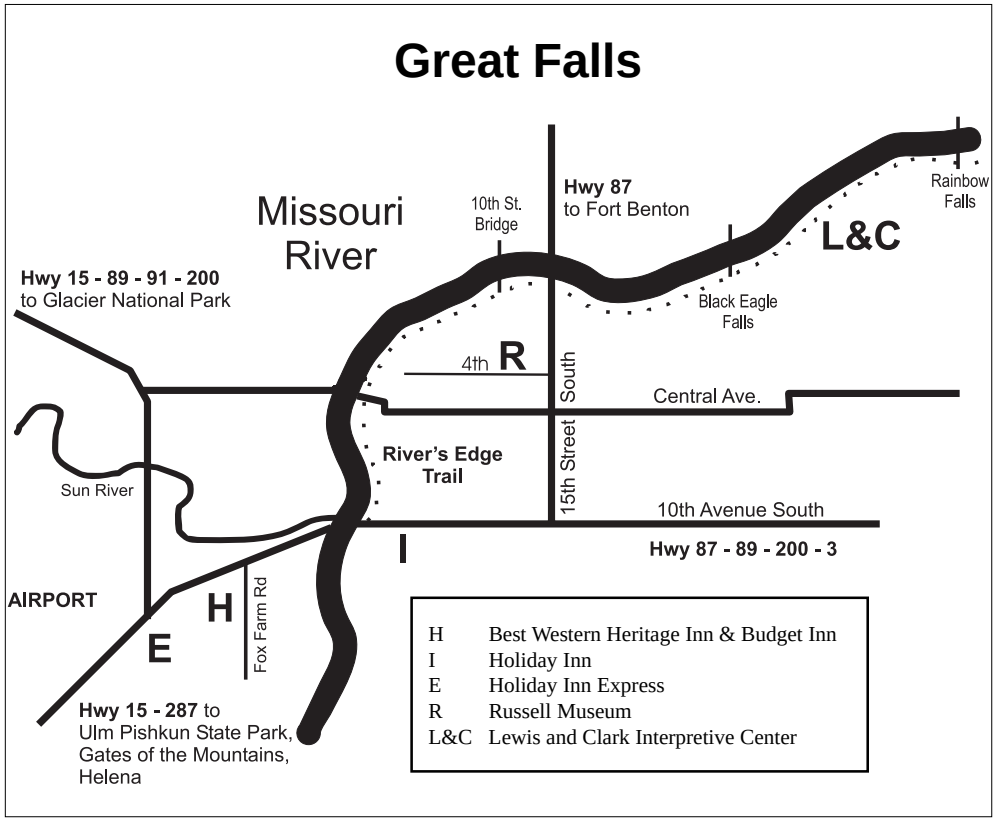
MO River Map	Back inside cover
6th Annual Conference Announcement	Back cover

Hotel Floor Plan



Great Falls



Schedule Overview

Sunday, June 24

Noon - 7:00 p.m.	Registration - *Convention Area*
	Exhibit and poster set-up - *Convention Area and Balcony*
1:00 - 5:00 p.m.	MRNRC Wildlife Meeting - *Paris-Venice Rooms*
3:00 p.m.	Missouri River Walking Tour - *Meet in lobby*
6:00 - 9:00 p.m.	Social - *C.M. Russell Museum (buses leave from lobby)*
6:30 p.m. and 7:45 p.m	Jack Gladstone performances - *C.M. Russell Museum*

Monday, June 25

7:00 a.m. - 5:00 p.m.	Registration - *Convention Area*
7:00 a.m. - 7:30 p.m.	Exhibits and posters - *Convention Area and Balcony*
	Computer Room - *Montana-Alberta Room*
10:00 a.m. - 3:00 p.m.	Helicoptor Display - *Hotel parking lot* (see page 14)

8:00 a.m.	**Introductory session** - *American-Britain-Canadian Rooms*
Noon	Lunch - on your own
	Presentations - *American-Britain-Canadian Rooms*
1:30 p.m.	(1) Upper Missouri National Wild and Scenic River
2:50 p.m.	Break - *Convention Area*
3:20 p.m.	(2) Flood Plain Management
5:30 - 7:30 p.m.	**Social with exhibit and poster session** - *Convention Area and Balcony*

Tuesday, June 26

8:00 a.m. - 2:00 p.m.	Exhibits and posters - *Convention Area and Balcony*
	Concurrent presentations
9:00 a.m.	(1A) Water Allocation - *American-Britain Rooms**
	(1B) Current Topics on Missouri River - *Canadian Room**
10:20 a.m.	Break - *Convention Area*
10:50 a.m.	(2A) Missouri River Water Quality - *American-Britain**
	(2B) Missouri River History - *Canadian Room**
Noon	Lunch - *Convention Area*
2:00 - 7:00 p.m.	**Native American Cultural Fair** with traditional bison feast - *Ulm Pishkun State Park (buses leave from lobby)*

Wednesday, June 27

8:00 a.m. - Noon . . .	Exhibits and posters - *Convention Area and Balcony*
	Concurrent presentations
8:00 a.m.	(3A) River Research and Monitoring - *American-Britain**
	(3B) Conservation Strategies - *Canadian Room**
9:40 a.m.	Break - *Convention Area*
10:10 a.m.	(4A) River Research and Monitoring - *American-Britain**
	(4B) Water Quality - *Canadian Room**
Noon	Lunch with Chip Groat and Jack Horner - *Convention Area*

** These rooms could be changed based on attendance - please designate which sessions you plan to attend at registration.*

Sunday, June 24

Schedule

Noon - 7:00 p.m.	**Registration** **Exhibit and Poster Set-up** *Heritage Inn Convention Area*
1:00 - 5:00 p.m.	**Missouri River Natural Resources Committee Wildlife Meeting** - *Paris-Venice Rooms*
3:00 p.m.	**Missouri River Walking Tours** *Meet in lobby*
6:00 - 9:00 p.m.	**Welcoming Social** - appetizers, cash bar *C.M. Russell Museum Complex* *400 13th St. North* *Buses available from hotel lobby*

Special thanks to the Western Area Power Administration for providing financial support for the Welcoming Social.

Charlie Russell vividly captured the spirit of the lands and people living near the headwaters of the Missouri River at the beginning of the 20th Century. The C.M. Russell Museum has the most complete collection of Russell's original art and personal objects in the world, including his 1900 log home and studio.

The Fireboat depicts the Native Americans amazement at a steamship traveling up the Missouri River to Fort Benton (courtesy of Russell Museum).

Welcoming Social Performances -
6:30 and 7:45 p.m.

JACK GLADSTONE

Jack gladstone is a nationally-renowned Blackfeet Indian singer, songwriter, and storyteller. He is masterful at blending legend, history and metaphor into song.

Schedule Monday, June 25

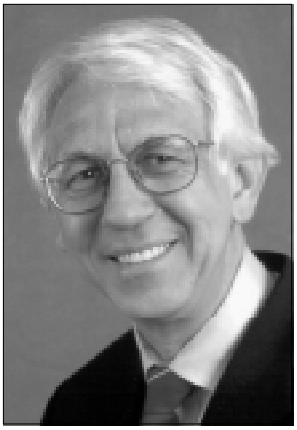
Registration
7:00 a.m. - 5:00 p.m.

Exhibits & Posters
Convention Area and Balcony
7:00 a.m. - 7:30 p.m.

8:00 a.m. **Opening Ceremonies** - Montana Tribes
American-Britain-Canadian Rooms

8:30 a.m. **Welcoming Addresses -** Chris Hunter, Conference Chairman
Great Falls Mayor Randy Gray
John Lane, Montana Fish, Wildlife and Parks Commission
Tom Casadevall, U.S. Geological Survey

9:15 a.m. *Keynote Address (page 26)*
Watershed Democracy:
An Idea Whose Time Has Come
Daniel Kemmis, Center for the Rocky Mountain West, University of Montana, Missoula, MT


Daniel Kemmis

10:00 a.m. BREAK - *Convention Area*

Morning Session (page 28)
Perspective on the
Missouri River in Montana

Moderator: Dave Mari, Bureau of Land Management

10:30 a.m. *Geological Perspective*
Dr. David Alt, University of Montana, Missoula, MT

11:00 a.m. *The First Nations*
Curly Bear Wagner, Going-To-The-Sun Institute, Browning, MT

11:30 a.m. *Some Tales of the Missouri*
Dr. Hal Stearns, Great Plains and American West researcher, writer and lecturer, Missoula, MT

Monday, June 25

Schedule

Noon LUNCH on your own

1:30 p.m. *Afternoon Session 1 (page 30)*
The Upper Missouri National Wild and Scenic River:
25 Years of Legislation, Hundreds of Years of Characters
American-Britain-Canadian Rooms
Moderator: Dave Mari, Bureau of Land Management

2:50 p.m. BREAK

Afternoon Session 2 (page 30)
Flood Plain Management
American-Britain-Canadian Rooms
Moderator: Mark Albers, American Rivers

3:20 p.m. *National Flood Plain Policy*
Scott Faber, Environmental Defense, Washington DC

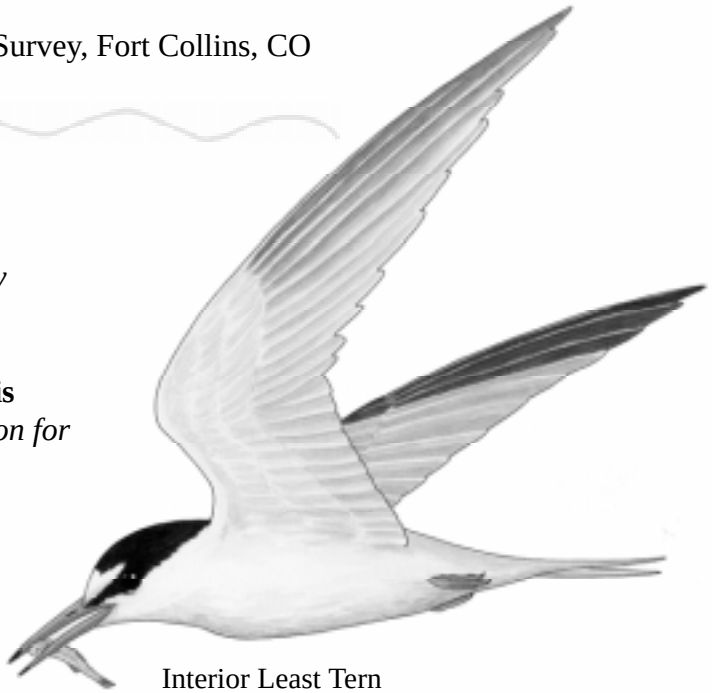
3:40 p.m. *Effects of Flow Regulation on the Upper Missouri River: Implications for Flood Pulse Restoration*
Michael Scott, U.S. Geological Survey, Fort Collins, CO

4:00 p.m. *Montana Flood Plain Manager's Perspective*
Karl Christians, Montana Department of Natural Resources and Conservation, Helena, MT

4:20 p.m. *Cottonwood Reproduction along the Wild and Scenic Reach of the Missouri River*
Gregory Auble, U.S. Geological Survey, Fort Collins, CO

5:30 p.m. *Evening Social*
Poster and Exhibit Session
Convention Area and Balcony
Appetizers and cash bar

Book Signing by Daniel Kemmis
This Sovereign Land: A New Vision for Governing the West



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Schedule Tuesday, June 26

Registration
7:00 a.m. - 2:00 p.m.

Exhibits & Posters
Convention Area and Balcony
8:00 a.m. - 2:00 p.m.

	Concurrent Session 1A (page 32) **Water Allocation:** *Compacting Process as a Way to Resolve Federal Reserved Water Rights in Montana* *American-Britain Rooms** Moderator: Chris Hunter, Montana Department of Fish, Wildlife, & Parks	Concurrent Session 1B (page 33) **Current Topics on the Missouri River** *Canadian Room** Moderator: Jim Berkley, U.S. Environmental Protection Agency, Region 8
9:00 a.m.	Rich Aldrich, Department of the Interior, Billings, MT	*Improving the Missouri River* Steve Mahfood, Missouri Department of Natural Resources, Jefferson City, MO
9:20 a.m.	Caleb Shields, Fort Peck Tribes, Poplar, MT	*Instream Structural Modifications for Habitat Diversity on the Lower River* Michael Chapman, Corps of Engineers, Kansas City, MO
9:40 a.m.	Susan Cottingham, Reserved Water Rights Compact Commission, Helena, MT	*USGS Missouri River Science* Pamela Haverland, U.S. Geological Survey, Columbia, MO
10:00 a.m.	Bill Bryan, Missouri Attorney General's Office, Jefferson City, MO	*Handling Uncertainty in Natural Resource Management Decisions: Adaptive Ecosystem Management Decisions* Tony Prato, University of Missouri, Columbia, MO
10:20 a.m.	BREAK - *Convention Area*	

* *Rooms are subject to change; please check outside rooms to verify sessions.*

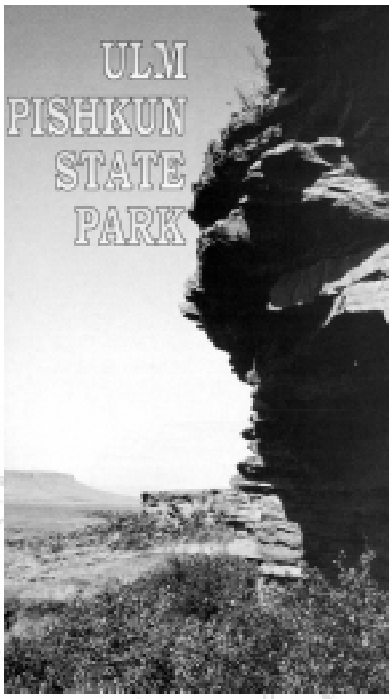
Tuesday, June 26

	Concurrent Session 2A (page 36) **Missouri River Water Quality** *American-Britain Rooms** Moderator: Ayn Schmit, U.S. Environmention Protection Agency, Region 8	Concurrent Session 2B (page 38) **Missouri River History** *Canadian Room** Moderator: Carol Mackin, Montana Department of Environmental Quality
10:50 a.m.	*The Water Quality Management Framework* Karen Hamilton, U.S. Environmental Protection Agency, Region 8, Denver, CO	*Was the Lewis and Clark Missouri River a Sinuous Ditch?* John LaRandeau, U.S. Army Corps of Engineers, Northwestern Division, Omaha, NE
11:10 a.m.	*Water Quality Issues on the Missouri River in Montana* Art Compton (invited), Montana Department of Environmental Quality, Helena, MT	*Lewis and Clark Natural History* Richard Terra, Upper Missouri Breaks Audubon, Great Falls, MT
11:20 a.m.	*Water Quality Monitoring on Large Rivers* Tom Quinn, NAWQA Program, U.S. Geological Survey, Cheyenne, WY	*The Impact of Fuel Wood Cutting on Upper Missouri River Cottonwoods during the Steamship Era.* Michael Merigliano, University of Montana, Missoula, MT
11:50 a.m.	*Integrating Water Quality with Other River Management Objectives* Tim Stearns, National Wildlife Federation	*Changes Through Time: A USGS Science Plan for the Lewis and Clark Bicentennial.* Dale Blevins, U.S. Geological Survey, Independence, MO

* *Rooms are subject to change; please check outside rooms to verify sessions.*

Schedule Tuesday, June 26

12:10 p.m. LUNCH
Convention Area



2:00 p.m. - 7:00 p.m. **Native American Cultural Fair**
Ulm Pishkun State Park
Sponsored by the Montana Tribal Tourism Alliance

Buses will run every half hour from the hotel to Ulm Pishkun and from Ulm Pishkun to the hotel until 7:30 p.m.
Parking is extremely limited at the park, so please don't drive your own vehicle.

The encampment at Ulm Pishkun State Park is a demonstration of the way Native Americans lived in the past. Seven Montana Tribes will set up tepees and Tribal members will share their stories of living on the Missouri River from past to present. Other events include traditional participatory games, arts, and crafts. The evening meal and gathering includes a bison feast with the buffalo furnished by the Fort Belknap Indian Community.

Wednesday, June 27

Exhibits & Posters
Convention Area and Balcony
8:00 a.m. - Noon

	Concurrent Session 3A (page 42) **River Research and Monitoring** *American-Britain Rooms** Moderator: Gene Zuerlein, NE Game and Parks Commission	Concurrent Session 3B (page 46) **Conservation Strategies** *Canadian Room** Moderator: Jeanne Heuser, U.S. Geological Survey
8:00 a.m.	*Sauger Surveys on the Lower Yellowstone River* Brad Schmitz, Montana Department of Fish, Wildlife, and Parks, Miles City, MT	*Conservation of a Missouri River Tributary: Working Across Private and Political Boundaries on the Teton* Seth Wilson, University of Montana, Missoula, MT
8:20 a.m.	*Potential Influence of Harvest on Shovelnose Sturgeon Populations in the Missouri and Yellowstone Rivers* Michael Quist, Kansas Cooperative Fish and Wildlife Research Unit, Manhattan, KS	*Citizen Participation in River Management Issues* Steve Burdic, Missouri River Communities Network, Columbia, MO
8:40 a.m.	*Overview of Status and Restoration Strategies of Westslope Cutthroat Trout in Northcentral Montana* Anne Tews, Montana Department of Fish, Wildlife and Parks, Lewistown, MT	*The Lower Platte River Corridor Alliance: An Intergovernmental Cooperative Approach to Water Quality* Gregory Fetterman, Lower Platte River Corridor Alliance, Lincoln, NE
9:00 a.m.	*Is Captive Rearing a Successful Management Tool for Piping Plovers in the Great Plains?* Robyn Niver, U.S. Fish and Wildlife Service, Pierre, SD	*Developing a Regional Conservation Strategy for the Upper Missouri River and the Northern Great Plains* Mary Anne Peine, Great Plains Conservation Project/The Ecology Center, Inc., Missoula, MT with Kyran Kunkel, Turner Endangered Species Fund; Minette Johnson, Defenders of Wildlife; Jonathan Proctor, Predator Conservation Alliance (double session)
9:20 a.m.	*The Biodiversity of Non-avian Terrestrial Vertebrates on the Benedictine Bottoms (1995-2000)* Martin Simon, Benedictine College, Atchison, KS	
9:40 a.m.	BREAK - *Convention Area*	

Schedule Wednesday, June 27

	Concurrent Session 4A (page 50) **River Research and Monitoring** *American-Britain Rooms* Moderator: Brad Schmitz, Montana Department of Fish, Wildlife, and Parks	Concurrent Session 4B (page 54) **Water Quality** *Canadian Room* Moderator: Deb Madison, Fort Peck Tribes
10:10 a.m.	*Upper Missouri River Environmental Monitoring and Assessment Program (EMAP-UMR): 2000 Pilot Study Findings and Future Directions* David Bolgrein, U.S. Environmental Protection Agency, Duluth, MN with Ted Angradi and Bill Schweiger, EPA, Denver, CO (double session)	A*griculture's Role in Water Quality Issues in the Missouri River Basin* Steve Mellis, University of Missouri Outreach & Extension, Columbia, MO
10:30 a.m.		*Algal-nutrient Relations in the Yellowstone River during Low-flow Conditions* Stephen Porter, U.S. Geological Survey, Denver, CO
10:50 a.m.	*Patterns of Larval Fish Abundance in Small Backwaters of the Upper Missouri River Basin* Kipp Powell, South Dakota State University, Brookings, SD	*Arsenic in Surface Water, Irrigated Soils and Groundwater of the Upper Missouri River Basin, Montana* Chuck Dalby, Montana Department of Natural Resources and Conservation, Helena, MT
11:10 a.m.	*Plant Communities of Temporarily and Seasonally Flooded Flood Plain Wetlands in the Upper Missouri River Basin* Ken Werlin, South Dakota State University, Brookings, SD	*Variation of Physical and Chemical Concentrations in Water Quality of the Lower Mussellshell River* O'Brien Hollow, University of Montana, Missoula, MT
11:30 a.m.	*Macroinvertebrate Composition in Seasonal Flood Plain Wetlands of the Upper Missouri River Basin* Neil Haugerud, South Dakota State University, Brookings, SD	*Effects of Riparian Vegetation on Water Volume and Aquatic Ecology of Central Great Plains River* Tom Eddy, Emporia State University, Emporia, KS
Noon	LUNCH - *Convention Area (page 58)* ***Missouri River Science: Looking Ahead*** Dr. Charles (Chip) Groat, Director U.S. Geological Survey, Reston, VA ***One Day 80 Million Years Ago*** Dr. Jack Horner, Curator of Paleontology Museum of the Rockies, Bozeman, MT	

Exhibits

Rapid Aerial River Assessment — Montana Style

Monday between 10 a.m. and 3 p.m.

A helicopter flies low over the river channel. The pilot skillfully maneuvers so three scientists can simultaneously record the features of the river on video and into a GIS database along with GPS location information.

The objective is to assess the status of the stream channel and flood plain, the condition of the riparian habitat, and the position of structures that affect the health of the stream. Plan to see the fully equipped helicopter along with its flight crew at the Heritage Inn parking lot on Monday between 10:00 a.m. and 3:00 p.m.

Sponsored by the Montana Department of Environmental Quality.

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Posters

Posters are listed alphabetically by title.

Detailed descriptions of posters on pages 17- 25.

A 3-D View of the Lower Missouri River
Mark Laustrup, U.S. Geological Survey, Columbia, MO (page 17)

Arsenic in Two Large Natural Water Systems at Great Falls, Montana
David Baker, Little Belt, Monarch, MT (page 17)

Assessing Water Depletion in the Missouri River Basin
Robert Bacon and John D. Drew, Missouri Department of Natural Resources, Jefferson City, MO (page 17)

Bird Diversity and Geomorphic Change in Riparian Forests
Michael Scott, U.S. Geological Survey, Fort Collins, CO (page 18)

Birds on Benedictine Bottoms Compared to Squaw Creek National Wildlife Refuge
Daniel Bowen, Benedictine College, Atchison, KS (page 19)

Evaluating Side-Channel Rehabilitation Design for the Lower Missouri River: An Ecosystem Approach to Adaptive Management
Maureen Gallagher, U.S. Fish and Wildlife Service, Columbia, MO (page 20)

Examining Flow Characteristics of the Missouri River
Robert Bacon and John D. Drew, Missouri Department of Natural Resources, Jefferson City, MO (page 21)

Fremont County's Two Rivers Project
David Carter, Fremont County, Iowa, Soil and Water Conservation District, Sidney, IA (page 21)

Invasive Plant Species Found along the Upper Missouri River
Mitch Forsyth and Ken Keever, Bureau of Land Management, Havre, MT (page 21)

Land Use Trends in Boone County Missouri
Daniel Zerr, Center for Agricultural, Resource and Environmental Systems--University of Missouri, Columbia, MO (page 22)

Multiple Uses of Wetlands: *How Wetland Restoration Can Benefit Flood Control, Recreation and Hunting*
Kristie McKinley, U.S. Department of Agriculture, Natural Resources Conservation Service, Sidney, IA (page 22)

Pallid Sturgeon: *The Road to Recovery*
George Jordan, U.S. Fish and Wildlife Service, Pierre, SD (page 23)

Providing Information through the Missouri River InfoLINK and NBII Node
Pamela Haverland, U.S. Geological Survey, Columbia, MO (page 23)

Solar Powered Drip Irrigation Systems for Restoration of Riparian Woodlands along the Upper Missouri River
Mitch Forsyth and Jody Peters Bureau of Land Management, Havre, MT (page 24)

State of the Upper Missouri River Basin
Thomas Johnson. U.S. Environmental Protection Agency, Denver, CO (page 24)

The Boundary Waters Treaty of 1909 and Flow Apportionment of the St. Mary-Milk Rivers: A History of Mutual Cooperation
Norm Midtlyng, U.S. Geological Survey, Helena, MT (page 24)

Using Laser Altimetry to Assess Post Flood Erosional and Depositional Change
Amit Kesarwani, Indiana State University, Terre, IN (page 25)

Posters

Posters listed alphabetically by title.

A 3-D View of the Lower Missouri River

Mark Laustrup
U.S. Geological Survey, Columbia Environmental Research Center, 4200 New Haven Road, Columbia, MO 65201
mark_laustrup@usgs.gov

CO-AUTHORS: Robert B. Jacobson and Joanna M. Reuter, U.S. Geological Survey, Columbia Environmental Research Center, Columbia, MO

The U.S. Geological Survey mapped depth, velocity and substrate four times between August 2000 and May 2001 to characterize a two-mile reach of the Lower Missouri River at Hermann, Missouri (rivermile 103.5). The work was intended to characterize spatial and temporal variation in physical river habitat prior to the replacement of a highway bridge. At the same time, the U.S. Fish and Wildlife Services' Columbia Fisheries Resources Office conducted a pallid sturgeon survey in the reach. The project provided an opportunity to map a 1-kilometer section, bank to bank and develop 3-D representations of depth, velocity and substrate. The poster graphically illustrates the complexity of river habitats associated with the channelized Lower Missouri River.

Arsenic in Two Large Natural Water Systems at Great Falls, Montana

David Baker
Little Belt Consulting Services, P.O. Box 906, Monarch, MT 59463

Water high in arsenic (As) flows out of hot springs in Yellowstone Park, but is diluted as it flows down the Madison and Missouri Rivers. At Great Falls river water contains 20 to 30 parts per billion (ppb). The current standard for As is 50 ppb, but the proposed new standard is only 5 ppb. The water treatment plant at Great Falls removes As. Treated water has about 2 ppb. Tiny mud particles naturally absorb As and remove it from river water. Below Fort Peck Dam the As concentration is only about 5 ppb because most of the As is deposited with mud on the bottom of the lake. Water enters the Madison Limestone Aquifer in the Little Belt Mountains. An estimated 600 cfs is discharged at Giant Springs.

Although there are many ore deposits in the Little Belts, As at Giant Springs is about 0.6 ppb. (Travel time is thousands of years.) For several months each year all of the flow of Belt Creek (and thus the acid mine drainage from inactive mines upstream) disappears into the limestone aquifer. How effective is limestone in removing arsenic? A few hundred meters in the subsurface? Is a disposal well in the limestone a practical option for acid mine drainage currently flowing from old mine adits into the creek?

The proposed Superfund designation for several local mining districts may provide the opportunity for a better understanding of this aquifer and how heavy metals are part of the natural environment.

Assessing Water Depletion in the Missouri River Basin

Robert Bacon
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CO-AUTHOR: John D. Drew, Missouri Department of Natural Resources, Jefferson City, MO

Water availability is a growing issue nationwide. Whether water is needed to irrigate agricultural lands, supply do-

mestic and industrial needs, maintain a healthy environment, or for any of the numerous other uses; it is becoming more and more precious and we should not take any water for granted. As river basins become more depleted, competition for water increases. Many river basins have already reached a point where almost every drop of water is consumed and are paying the price both environmentally and economically.

This poster explores what we know about depletions in the Missouri River Basin, and the impacts that a growth in depletions might cause. The Missouri Department of Natural Resources has been actively involved in this issue on the Missouri River for a long time and has played a role in the last major effort to quantify depletions that was completed in the 1980s.

There are several points that make this presentation on depletions a timely topic. These include (1) recovery of the endangered species, (2) recent debates over the management of the Missouri River Main Stem Reservoir System, (3) ongoing proposals to divert water out of the basin, and (4) new insights of the impacts caused by a growth in depletions aided by the Corps *Master Manual* analysis. On many rivers, water rights are at the heart of the debate on the recovery of endangered species. A heightened awareness about depletions may help us avoid problems experienced in other river basins. In fact, the Missouri River Basin may have options that are no longer feasible in other river basins.

BIO: Robert R. Bacon is a Hydrologist in the Water Resources Program of the Missouri Department of Natural Resources working on river basin issues and serves on the Missouri River Basin Association (MRBA) technical subcommittee. He graduated with a Masters of Science in Fisheries and a Bachelors of Science in Biology with a minor in Chemistry from the University of Missouri-Columbia. He has worked professionally as a research statistician, and quality control chemist. His experience includes water resource planning, water supply analysis, toxicology assays, water quality studies in temperate and tropical limnology and has conducted an international crocodile population inventory.

John D. Drew is the Chief Hydrologist in the Water Resources Program of the Missouri Department of Natural Resources. He has over 15 years of hydrology experience and has been involved in Missouri River issues for over a decade. He is the Governor's alternate representing Missouri on the MRBA, has participated in several MRBA technical subcommittees and chaired the MRBA modeling/hydrology sub-committee for the review and update of the *Missouri River Master Water Control Manual.* His experience includes wetlands research and planning, flood studies, water supply analysis, development of *Missouri's State Water Plan,* water quality, erosion control design, environmental compliance, serving as a member of the Missouri State Park's Threats Committee, and other aspects of water resources.

Bird Diversity and Geomorphic Change in Riparian Forests

Michael Scott
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CO-AUTHORS: Susan K. Skagen, and Gregory T. Auble, U.S. Geological Survey, Midcontinent Ecological Science Center, Fort Collins, CO; Michael Merigliano, University of Montana, Missoula, MT

We examined how bird species composition, richness, and abundance responded to variation in vegetation structure along

a 96-km section of the Wild and Scenic reach of the upper Missouri River in central Montana. Patterns of breeding bird use of forested and non-forested riparian habitat patches were linked to fluvial geomorphic processes and land use practices.

Species richness and bird diversity increased with increasing structural complexity of vegetation ($F_{1,32} = 75.49$, $p < 0.0001$; $F_{1,32} = 79.76$, $p < 0.0001$, respectively). Bird species composition was significantly correlated with vegetation strata diversity ($F_{1,32} = 134.54$, $p < 0.0001$). Bird abundance in canopy and tall shrub foraging guilds increased significantly with increasing tree and tall shrub cover ($F_{1,22} = 34.68$, $p < 0.0001$; $F_{1,20} = 22.22$, $p < 0.0001$, respectively). Seventeen bird species were strongly associated ($p < 0.10$) with structurally complex riparian forest patches, whereas only three bird species were strongly associated with structurally simple riparian patches.

We related structural complexity of riparian patches to geomorphic change, woody vegetation establishment, and grazing history over a 35-year post-dam period. Patch structural complexity was positively related to recent sediment accretion ($t_{33} = 3.307$, $p = 0.002$) and vegetation establishment ($t_{20.7} = -3.63$, $p = 0.002$), and negatively related to grazing activity ($t_{19.6} = 3.75$, $p = 0.001$).

Avian conservation along the Upper Missouri River requires geomorphic processes responsible for tree establishment as well as management of land use activities in riparian forests.

BIO: Michael L. Scott is a Research Ecologist for the U.S. Geological Survey in Fort Collins, Colorado, and serves as Affiliate Faculty in the Departments of Biology and Forestry at Colorado State University. His research interests include the biology and ecology of cottonwood and understanding how stream flow, channel change, and vegetation dynamics interact to shape and sustain western riparian forests. He received his Ph.D. in Forest Ecology from Michigan State University, did Post-doctoral work on forested wetlands at the University of Georgia, and was a Research Associate at Oregon State University.

Birds on Benedictine Bottoms Compared to Squaw Creek National Wildlife Refuge

Daniel Bowen
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Documentation of bird diversity is part of a larger study of biodiversity taking place on the Benedictine Bottoms. The Bottoms mitigation site is part of the *Missouri River Fish and Wildlife Mitigation Project* developed and administered by the Corps of Engineers and maintained and operated by Kansas Department of Wildlife and Parks. The return of the Bottoms from farm land to a riparian woodland/wetland complex was most intense during development from 1994 - 1997 when 176,100 trees and 750 acres of native grass and legumes were planted; 16 wetland units were constructed; and three wells and pumps were installed.

Since December 1994, 687 hours of observations on 172 days have been made to sample bird species, numbers of individuals, and the breeding status of all bird species in season. The mitigation site thus far has attracted 78 breeding bird species and 137 total bird species. *Squaw Creek National Wildlife Refuge*, 50 km up river, with mature wetland and woodland habitats has listed 102 breeding birds and 273 total bird species (plus 36 accidentals). On the Bottoms we have seen 54 aquatic/wetland species among the grebes, herons, ducks, geese, plovers, sandpipers, gulls, and terns, which is 57% of 95 species seen at Squaw Creek.

Of 41 vireos, warblers, and finches, here used as indicators of woodland species at Squaw Creek, only 6 (15%) are found on Benedictine Bottoms.

In these types of comparisons the largest component of bird species still missing on Benedictine Bottoms but present on Squaw Creek are woodland birds. Although a few large trees on the Bottoms remain in a narrow riparian zone near the Missouri River and Independence Creek, the trees planted by the Corps are still less than 2 m. The missing woodland bird species will increase slowly as the planted trees mature. Funding came from Benedictine College and the Kansas Department of Wildlife and Parks.

BIO: Daniel Bowen is a Professor of Biology at Benedictine College. He is Program Director, Benedictine Bottoms Missouri River Biodiversity Assessment Program. He received his Ph.D. from Kansas State University.

Evaluating Side-Channel Rehabilitation Design for the Lower Missouri River: *An Ecosystem Approach to Adaptive Management*

Maureen Gallagher
U.S. Fish and Wildlife Service, Big Muddy National Fish and Wildlife Refuge, 4200 New Haven Road, Columbia, MO 65201
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Lack of off-channel aquatic habitat has been identified as a critical problem on the Lower Missouri River. Habitat rehabilitation projects have focused on restoring side channels (chutes), but the ecological benefits have not been well documented. This project will provide baseline information that can be used to evaluate the effectiveness of varied management efforts using three parameters: chute habitat dynamics, fish community structure, and shorebird use of sandbars and mudflats.

The study area will consist of three units of the *Big Muddy National Fish and Wildlife Refuge* with varying degrees of hydrologic manipulation within the river system. Detailed maps of depth, velocity and substrate at a design discharge will document quantity and quality of aquatic habitat among the three chutes and will be used to quantify sandbar habitat (area of sand bars existing at different discharges). These detailed measurements will be correlated with species composition and relative abundance of fish species and shorebird species.

Information gathered will have ecosystem-wide implications (contributing to ongoing work) providing a multi-agency team of managers, biologists, and hydrologists with some of the tools necessary to manage the Missouri River floodplain in an adaptive, interdisciplinary way. This information will be correlated with data (using standardized protocols) from the mitigation project at Hamburg Bend in Nebraska, *Boyer Chute National Wildlife Refuge,* and main channel analysis completed near Hermann, MO.

BIO: Maureen Gallagher has been a biologist with the U.S. Fish and Wildlife Service for ten years: Since 2000 as refuge biologist for the Big Muddy developing the biological program for the refuge in collaboration with other federal, state, and local agencies and organizations; four years at the Morris Wetland Management District in western Minnesota restoring wetlands and tallgrass prairie on private lands; five years at the Ashland Fisheries Resources Office in Wisconsin providing habitat restoration technical assistance to twenty-eight Native American tribes in Wisconsin, Minnesota, and Michigan. She has two Bachelors of Science degrees from Humboldt State University in Aquatic Ecology and Zoology and is currently working on a Master of Arts degree in Political Science at the University of Missouri - Columbia.

Examining Flow Characteristics of the Missouri River

Robert Bacon
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CO-AUTHOR: John D. Drew, Missouri Department of Natural Resources, Jefferson City, MO

Since the U.S. Army Corps of Engineers opened up the review and update of the *Missouri River Master Water Control Manual*, the discussion has largely focused on flow issues, specifically below Gavins Point Dam. The combination of flow and habitat, along with other factors such as water temperature, sediment load and carbon input, have been discussed with relation to available aquatic habitat. Low flow characteristics are also important to those interested in water supply, power generation and water quality. This poster will explore a variety of flow characteristics on the Missouri River.

BIO: See page 18.

Fremont County's Two Rivers Project

David Carter
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For the past two decades, Fremont County, Iowa, has been plagued with flooding. The East and West Nishnabotna Rivers, have destroyed crops, levees, and homes through much of the county. Also the town of Hamburg, near the confluence of the Nishnabotna and Missouri Rivers, has had a history of damaging floods, especially in the last 20 years.

In the summer of 1999, the Fremont County Soil and Water Conservation District began the *Two Rivers Project* to help farmers enroll in the Wetlands Reserve Program and the Emergency Watershed Program. The project is an Environmental Protection Agency funded wetland development grant. Fremont County now has over 5,080 acres of cropland and timber enrolled in the two programs, and over 3,000 acres of land are on the ranking list with the state of Iowa.

Two Rivers Project has expanded to working Shallow Water Areas in the Conservation Reserve Program, cooperative planning with the county's economic development corporation, and an outdoor learning center for local schools.

BIO: David Carter is the Project Coordinator for the *Two Rivers Project*, a water quality grant with the EPA. The *Two Rivers Project* started in June of 1999 and will be active until 2004.

Invasive Plant Species Found Along the Upper Missouri River

Mitch Forsyth
Bureau of Land Management, Havre Field Station, Drawer 911, Havre, MT 59501 mforsyth@mt.blm.gov

CO-AUTHOR: Ken Keever, Bureau of Land Management, Havre, MT

The Upper Missouri River, as part of the Upper Missouri Breaks National Monument and Upper Missouri National Wild and Scenic River system, has seen a significant increase in the amount and distribution of noxious weeds and invasive plants in the past 10 to 15 years. Leafy spurge, Russian and spotted knapweed and Canada thistle have become commonplace along the entire

length of river – the same impressive landscape that Lewis & Clark described nearly two centuries ago.

More recently, new invaders such as salt cedar, purple loosestrife and perennial pepperweed have been sited along river banks and in campgrounds and river bottoms. Currently, 14 noxious weeds infest about 500 acres of public land within the monument. This represents an increase of 23% per year since 1978.

Clearly this expansion and invasion of noxious weeds places many of the unique resources found within the monument at risk. To reverse this trend, the Bureau of Land Management is developing an ecosystem wide weed management plan. The plan will recommend and implement a combination of treatment strategies to suppress or eradicate existing invasive plant populations and prevent the introduction of invasive plants into "weed free" areas.

Land Use Trends in Boone County Missouri

Daniel Zerr
Center for Agricultural, Resource and Environmental Systems (CARES), University of Missouri - Columbia, 130 Mumford Hall, Columbia, MO 65211
zerrd@missouri.edu

Using Landsat TM imagery, land use trends in Boone Co, MO from the mid 80s through 1999 are displayed.

BIO: Daniel Zerr has held the position of research associate at CARES since June, 2000. His research includes land use and land cover applications using Landsat and Ikonos satellite imagery. Prior to the current position he worked as an ecologist/GIS specialist for the USGS Northern Prairie Wildlife Research Center in Jamestown, ND. He is a native of South Dakota and worked as a professional radio broadcaster there for thirteen years before returning to school. He holds a BS in biology from Northern State University in Aberdeen, SD and an MS in environmental science from the School of Public and Environmental Affairs at Indiana University, Bloomington, IN.

Multiple Uses of Wetlands: *How Wetland Restoration Can Benefit Flood Control, Recreation and Hunting*

Kristie McKinley
U.S. Department of Agriculture, Natural Resources Conservation Service, P.O. Box 490, Sidney, IA 51652
kristie.Mckinley@ia.usda.gov

Fremont County, Iowa has a long history of flooding problems along both the Missouri and Nishnabotna Rivers. Wetland programs have been in place in the county since 1994, after the major floods of 1993. Traditional wetland restoration programs have focused only on the restoration and not on other uses of wetlands such as flooding control, recreation, hunting or education.

In 1999, EPA funded a five year grant to hire a full time wetland specialist in the county to complete over 10,000 acres of multiple use wetland restorations. To date over 5,000 acres of permanent wetland easements have been enrolled in USDA programs. Most of these easements are designed to control flooding by taking in waters only when the rivers are reaching flood stages.

One such easement was designed and paid for by a local drainage district in cooperation with the town of Hamburg to protect the town from flooding. In 1998, this wetland saved Hamburg from flooding. Other easements are being used as silt basins to protect the river from water quality impacts of soil erosion entering the river system.

One of the newest uses of wetland restoration we are working with is education and outreach. We are working to complete a 4 mile bike trail/dike

located within a 2,000 acre wetland on the Missouri River adjacent to the new $1.2M Iowa Visitor's Center. The Iowa Visitor's Center will focus on wetland restoration activities and our office will provide weekly tours to the public.

BIO: Kristie McKinley has been District Conservationist for the Natural Resources Conservation Service in Sidney, Iowa since 1998. She has been working on an EPA grant to complete 10,000 acres of wetland restoration in the county and to-date has completed over 5,000 acres in 18 months with multiple uses of wetlands in design. She has a BS in Agribusiness from Oklahoma State University.

Pallid Sturgeon: *The Road to Recovery*

George Jordan
U.S. Fish and Wildlife Service, 420 South Garfield Ave, Suite 400, Pierre, SD 57501 george_jordan@fws.gov

The pallid sturgeon (Scaphirhynchus albus) was Federally listed as an endangered species on September 6, 1990. At that time, very little information was available about this species, its life history, its habitat needs and the reasons for its continued decline. Over the past decade, efforts have been expended to develop an understanding of the current status of the populations, habitat needs and behaviors for all life stages of the pallid sturgeon and to determine the cause(s) for the decline. Recovery efforts currently include habitat restoration, population augmentation, public outreach/education, and protection. This poster will highlight some of the recovery efforts on the Missouri River.

Providing Information through the Missouri River InfoLINK and NBII Node

Pamela Haverland
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CO-AUTHOR: Jeanne Heuser, U.S. Geological Survey, Columbia, MO

Decisions related to Missouri River management affect the lifestyles of Americans from Montana to Missouri. Federal and state resource agencies, non-government organizations, and the pubic need access to critical biological information to more effectively address the conflicting demands on natural resources. It is the vision of the Missouri River InfoLINK (InfoLINK), (http://infolink.cr.usgs.gov/) partners that sharing information on the Missouri River will facilitate communication among all of the basin's citizens.

Today, the InfoLINK provides information through outreach materials, interactive maps, and presentations that interpret scientific findings. Expanding the information available to Missouri River constituents is the focus of enhancing the InfoLINK through the National Biological Information Infrastructure (NBII), a nation-wide, Web-based network of biological information supported by the USGS.

When enhancements begin, the InfoLINK through its NBII-2 network will expand the web access gateway to biological information and decision support tools for the Missouri River basin. When fully implemented, the expanded InfoLINK will be a state-of-the art web information center that is designed to serve relevant data and provide for custom analysis tools such as report generators, mapping capability,

super-computer simulation models, and decision support systems.

The InfoLINK was established through a partnership with the U.S. Environmental Protection Agency, Region 7 and the USGS's Columbia Environmental Research Center, Central Regional Biologist's Office, and NBII.

BIO: See page 34

Solar Powered Drip Irrigation Systems for Restoration of Riparian Woodlands along the Upper Missouri River

Mitch Forsyth
Bureau of Land Management, Havre Field Station, Drawer 911, Havre, MT 59501 mforsyth@mt.blm.gov

CO-AUTHOR: Jody Peters, Bureau of Land Management, Havre, MT

Old growth cottonwood forests are rapidly disappearing along sections of the Upper Missouri River. Willow and cottonwood recruitment sites are limited and impacted by dams, ice, flooding, deposition and animals. Two sites were selected for native tree and shrub plantings as an alternative to natural reproduction. Green ash, boxelder, buffaloberry, chokecherry, rose and dogwood were planted throughout the understory of decadent cottonwood groves to replicate natural succession. Plantings were watered with solar powered drip irrigation systems.

State of the Upper Missouri River Basin

Thomas Johnson
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johnson.tom@epa.gov

This project presents a compilation of GIS data layers designed to express the status of, and impacts to, the Upper Missouri River Basin. Maps are presented showing the status of water quality, wetlands and sensitive species. Similarly, impacts of agriculture, point source discharges, water use, land use, and population are portrayed. The most sensitive and potentially impacted areas are highlighted through an analysis of these layers. The purpose of this project is to provide both a view of the status of the Upper Missouri Basin and to help focus on those areas with the greatest environmental issues.

The Boundary Waters Treaty of 1909 and Flow Apportionment of the St. Mary-Milk Rivers: A History of Mutual Cooperation

Norm Midtlyng
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In the late 1800's, the United States began investigations into developing the St. Mary River (which flows northward into Canada) as a reliable water supply source for agricultural use in the Milk River basin. This interest, coupled with Canada's concern over loss of water for proposed irrigation projects in southern Alberta, resulted in a series of negotiations between Great Britain and the United States and eventually led to the signing of the Boundary Waters Treaty of 1909.

The Boundary Waters Treaty of 1909 provides the principles and guidelines necessary to help prevent or resolve issues related to the use of boundary waters. The Treaty also established an impartial commission, referred to as the International Joint Commission (IJC), to administer the Treaty and to assist each government in finding solutions to problems that might arise.

Article VI of the Treaty addressed water allocation for power and irrigation of the St. Mary and Milk Rivers (and their tributaries). However, the Treaty did not provide specific guidance concerning measurement and division of those waters and a major controversy as intense as one that led to the Treaty erupted. Several public hearings were held in Alberta, Montana, and Saskatchewan by the IJC to settle the matter. After careful consideration, the IJC issued an Order clarifying the method of measurement and division of the St. Mary and Milk Rivers on October 4, 1921.

The IJC Order of 1921 is still in effect today. However, the actual natural flow computational procedures continue to evolve through a process of cooperative consultation under the direction of the IJC between the Water Survey of Canada (WSC) and the United States Geological Survey (USGS) and other stakeholders.

BIO: Norm Midtlyng is the Chief of International Waters Section, Montana District, U.S. Geological Survey. He has been involved in international flow apportionment of the St. Mary and Milk Rivers since 1986.

Using Laser Altimetry to Assess Post Flood Erosional and Depositional Change

Amit Kesarwani
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CO-AUTHORS: Basil Gomez, Indiana State University, Terre Haute, IN; Robert B. Jacobson, U.S. Geological Survey, Columbia, MO; and Laurence Smith, University of California, Los Angeles, CA

Rapid post-event measurements of the location and depth of erosional/depositional features are necessary for the effective mobilization and allocation of resources during the recovery and mitigation efforts that both local and federal agencies initiate in the aftermath of large scale riverine flooding such as that which occurred during the 1993 flood on the Lower Missouri River.

We used NASA's Airborne Topographic Mapper (ATM) laser altimeter to estimate net erosion and deposition at Lisbon Bottom on the Missouri river flood plain. The ATM is a conically scanning airborne laser altimeter system capable of acquiring a 250 m wide swath of precise topographic measurements, with typical spot spacing of 1-3 m, and a vertical precision of 10-15 cm.

Georeferenced surface elevation data are obtained using the ATM ranging data in combination with real time differential GPS tracking, and precise measurements of aircraft attitude. The georeferenced data can in turn, be used to generate high (vertical and spatial) resolution Digital Elevation Models that permit characterization of morphological change and patterns of erosion and deposition. Net topographic change by flood erosion and deposition may be assessed through elevation difference mapping, by making comparison with (typically lower resolution) pre-flood DEM's.

Thus, airborne laser altimeter data may be used to make accurate estimations of the amount of erosion and deposition associated with large scale flooding in timely and cost-effective manner. The ATM data may also facilitate flood-hazard mapping and be applied to the management of flood plain ecosystems.

KEYNOTE ADDRESS

Monday
June 25

Keynote Address

9:15 a.m. - 10:00 a.m.

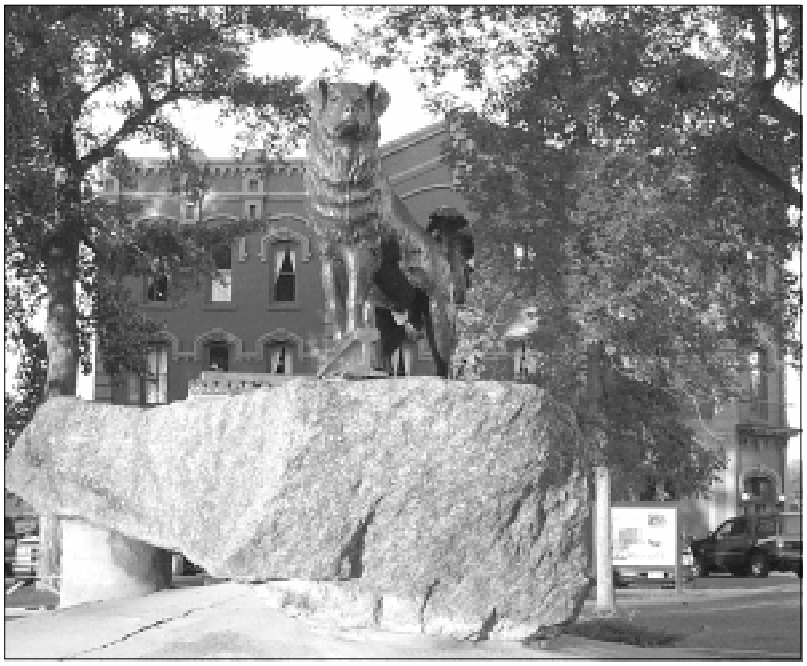
Watershed Democracy: An Idea Whose Time Has Come

Daniel Kemmis
Center for the Rocky Mountain West, Milwaukee Station, 2nd Floor, University of Montana, Missoula, MT 59812-3096 rocky@crmw.org

Daniel Kemmis, Director of the Center for the Rocky Mountain West, is the former Mayor of Missoula, a former Speaker and Minority Leader of the Montana House of Representatives, and a four-term Montana legislator. Mr. Kemmis serves on the Boards of Directors of the Northwest Area and Kettering Foundations, the Institute for Environment and Natural Resources, the Bolle Center for People and Forests, the American Planning Association's Growing Smart Project, and Redefining Progress. He serves on the Advisory Boards of the Western Governors' Association's Enlibra Project and the Brookings Institution's Center on Urban and Metropolitan Policy.

Mr. Kemmis is the author of *Community andThe Politics of Place* and *The Good City and the Good Life.* Island Press will publish his newest book, *This Sovereign Land: A New Vision for Governing the West*, in the spring of 2001. He has had articles published in national and regional magazines and journals on such topics as community and community building, city design, bioregionalism, and the economy and politics of the West.

He was recognized by the Utne Reader in 1995 as one of its "100 Visionaries." President Clinton awarded Mr. Kemmis the Charles Frankel Prize for outstanding contribution to the field of the humanities and appointed him to the American Heritage Rivers Commission. Other awards include the Society for Conservation Biology's Distinguished Achievement Award for Social, Economic and Political work; Center of the American West Wallace Stegner Prize for sustained contribution to the cultural identity of the West; a fellowship at the Harvard Kennedy School's Institute of Politics; and the Pinchot Distinguished Lecturer in Washington, D.C. Mr. Kemmis is a graduate of Harvard University and the University of Montana Law School.



Old Shep in front of the recently restored Grand Union Hotel on the Missouri River levee in Fort Benton.

Notes

Monday
June 25

Morning
Sesson

Perspective on the Missouri River in Montana

10:30 a.m. - Noon

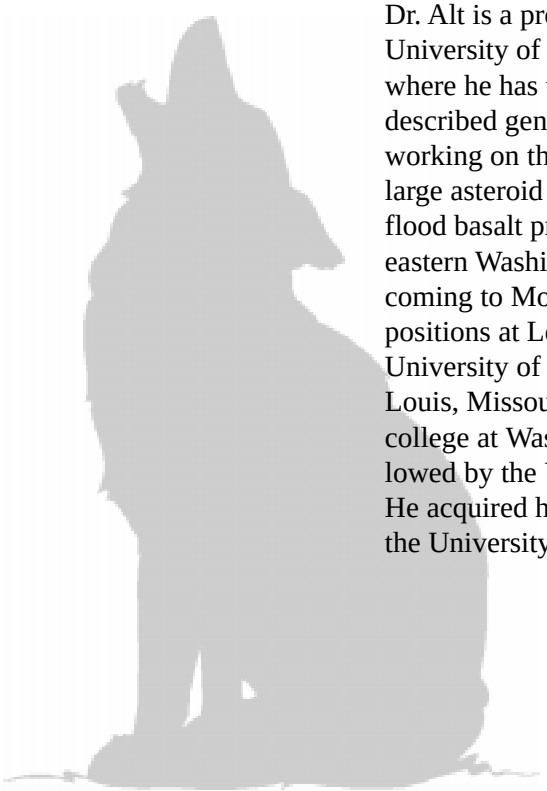
MORNING SESSION

PERSPECTIVE ON THE MISSOURI RIVER IN MONTANA

Geologic Perspective

David Alt
University of Montana, Department of Geology, Missoula, MT 59812-1019

Glacial Lake Missoula filled behind an ice dam in northern Idaho, then emptied catastrophically when the ice dam floated and burst. This happened several dozen times between 15,000 and 13,000 years ago as ice flowing south down the Purcell Valley from British Columbia continued to establish new ice dams. Each dam failure dumped a cataclysmic flood across eastern Washington and down the Columbia River. Many geologists rebelled at the notion of catastrophic floods when it was first proposed in 1923, launching a controversy that did not finally end until all the principal antagonists were dead.



Dr. Alt is a professor of Geology at the University of Montana in Missoula, MT where he has taught since 1965. A self-described generalist, Dr. Alt is currently working on the relation between very large asteroid impacts and the eruption of flood basalt provinces, such as the one in eastern Washington and Oregon. Before coming to Montana, Dr. Alt held faculty positions at Leeds in England and the University of Florida. He is from St. Louis, Missouri where he attended college at Washington University followed by the University of Minnesota. He acquired his doctorate in geology at the University of Texas.

The First Nations

Curly Bear Wagner
Going-To-The-Sun Institute, P.O. Box 2038, Browning, MT 59417
cbear@3rivers.net

Curly Bear Wagner, historian and Blackfeet cultural leader, relates history from the First Nation's perspective through a variety of different Blackfeet tours and educational CDs. He founded a non-profit foundation called *Going-To-The-Sun Institute* in order to teach history from the First Nation's perspective. His work includes stories about the Blackfeet encounter with Lewis and Clark, Starvation Winter of 1863-64, traditions and history of the land and people, as well as his own experience with repatriation issues and preservation of the traditional way of life.

Prior to 1995, Mr. Wagner was an independent consultant and business owner as well as the Director of the Blackfeet Cultural Program. He has been involved in the production of numerous documentaries and television features highlighting Blackfeet culture, animals, the Rocky Mountains, and Glacier National Park. He has been featured in articles for such magazines as the Smithsonian Magazine, Historical Preservation, and National Audubon Society. He is a member of numerous organizations and boards including the Plains Indian Museum, Council of Traditional Knowledge, and National Congress of American Indians. Mr. Wagner received the Governor's Tourism Award in 1992 and the Montana Historic Preservation Award in 1993.

He has studied business administration and Indian Studies Leadership at Western and Eastern Montana College and is a Vietnam Veteran.

Some Tales of the Missouri

Hal Stearns
University of Montana, 606 N. Pearl,
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On a June day in 1673, the French missionary priest Jacques Marquette reached the mouth of the Pekitanoui, the great river from the West. Since that time, the "Big Muddy" still captures our imagination. Hal Stearns will recreate and give some perspective to the interesting and provocative Missouri and its story and all the people who have loved, hated, battled, and thrived along its banks.

Hal Stearns is a researcher, writer and lecturer on the Great Plains and American West. He weaves the past and present, culture and geography into his interpretations of the West. The rich literature, hardworking and persistent people, fascinating characters, and telling events are all part of his history tales.

Dr. Stearn's career has included teaching at the high school level in Montana and Germany. He was honored as Montana's Teacher of the Year and Montana's outstanding U.S. History Teacher, and was commended for his teaching by the U.S. West Corporation. For the past six years, he has taught and administered graduate programs for the University of Montana. He attained the rank of brigadier general in his other career with the Montana Army National Guard.

Dr. Stearns served terms on Montana's Coal Board, Law Foundation, and Committee for the Humanities. He is on the Lewis and Clark Bicentennial Commission in Montana and Nebraska. He is a frequent speaker-historian across the United States and serves as a tour guide, especially relating to the Lewis and Clark Expedition.

Dr. Stearn's went to the University of Notre Dame and received advanced degrees from the University of Montana. Military schools include OCS, Command and General Staff and the Army War College.

Fort Benton, Gateway to the Upper Missouri National Wild and Scenic River.

Papers

Monday
June 25

Afternoon Sessions 1 and 2

1:30 p.m. - 4:40 p.m.

SESSION 1

UPPER MISSOURI NATIONAL WILD AND SCENIC RIVER

Dave Mari
Bureau of Land Management, P.O. Box 1160, Lewistown, MT 59457
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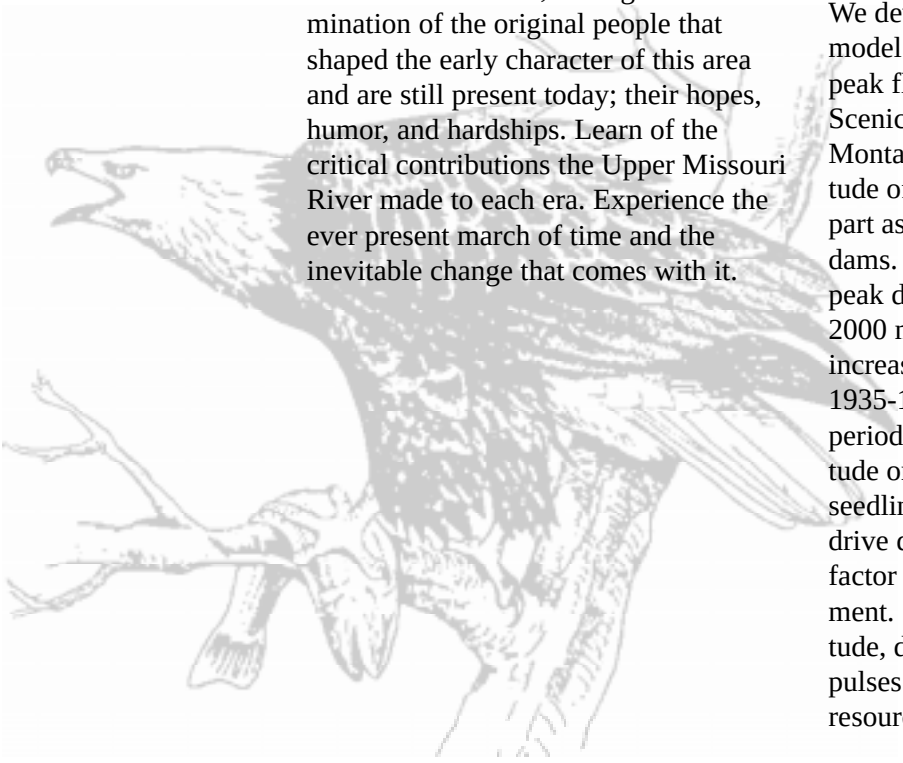
This year marks the 25th Anniversary of the legislation that added the Upper Missouri River to the Wild and Scenic Rivers Act. The Bureau of Land Management's Lewistown Field Office will present a story of the people and personalities who shaped the river's history yesterday and are shaping its future today.

Experience first-hand, the characters - a Native American, a Lewis and Clark Expedition crew member, a fur trader, a rustler, a homesteader, a cattleman, and a recreationist/conservationist. Each character, dressed in the attire of the day, will appear in sequence according to the time his or her character occupied the area and explain the role the river and its uplands played in their daily lives.

Share the adventure, courage and determination of the original people that shaped the early character of this area and are still present today; their hopes, humor, and hardships. Learn of the critical contributions the Upper Missouri River made to each era. Experience the ever present march of time and the inevitable change that comes with it.



SESSION 2

FLOOD PLAIN MANAGEMENT

National Flood Plain Policy

Scott Faber
Environmental Defense, 1875 Connecticut Ave NW, Washington, DC 20009

Effects of Flow Regulation on the Upper Missouri River: *Implications for Flood Pulse Restoration*

Michael Scott
U.S. Geological Survey, Midcontinent Ecological Science Center, 4512 McMurry Ave., Fort Collins, CO 80525
Mike_L_Scott@usgs.gov

CO-AUTHOR: Ken Bovee, U.S. Geological Survey, Midcontinent Ecological Science Center, Fort Collins, CO

We developed a mass balance flow model to reconstruct unregulated daily peak flows in the National Wild and Scenic reach of the Missouri River, Montana. Results indicate that magnitude of peak flows has been reduced in part as a consequence of two upstream dams. The recurrence interval for annual peak discharges greater than or equal to 2000 m3/sec at the Virgelle gage had increased from 11.5 years for the period 1935-1956 to 45 years for the post-dam period 1957-1999. Floods of this magnitude or greater position cottonwood seedlings above the zone of frequent ice-drive disturbance, and thus are a critical factor in cottonwood forest replenishment. Restoring the frequency, magnitude, duration, and timing of these flood pulses would benefit important natural resource values including riparian forests

and native fish species in the Upper Missouri River basin.

However, efforts to naturalize flow must be made in the context of a water management system that was authorized and constructed for the primary purposes of flood control, power generation, and irrigation. Using our flow model and flood damage curves, we examine a range of options for delivering flows greater than or equal to 1850 m3/sec to the Wild and Scenic reach. Whereas some scenarios appear to be politically and economically infeasible, our analysis suggests that there is enough operational flexibility in the system to produce flood pulses without greatly compromising other values. Interestingly, constraints to pulse flow restoration may result from flood control considerations on the Lower Missouri River, outside of the region.

BIO: Michael L. Scott is a Research Ecologist for the U.S. Geological Survey in Fort Collins, CO, and serves as Affiliate Faculty in the Departments of Biology and Forestry at Colorado State University. His research interests include the biology and ecology of cottonwood and understanding how stream flow, channel change, and vegetation dynamics interact to shape and sustain western riparian forests. He received his Ph.D. in Forest Ecology from Michigan State University, did Post-doctoral work on forested wetlands at the University of Georgia, and was a Research Associate at Oregon State University.

State Flood Plain Policy

Karl Christians
Montana Department of Natural Resources and Conservation, 48 North Last Chance Gulch, PO Box 201601, Helena, MT 59620

BIO: Flood Plain Management Section Supervisor

Cottonwood Reproduction Along the Wild and Scenic Reach of the Missouri River

Gregory Auble
U.S. Geological Survey, Midcontinent Ecological Science Center, 4512 McMurry Avenue, Fort Collins, CO 80526 greg_auble@usgs.gov

Michael Scott, U.S. Geological Survey, Denver, CO; Joseph Frazier, Bureau of Land Management; Michael Merigliano, University of Montana, Missoula, MT

Cottonwood stands along the Wild and Scenic reach of the Missouri River from Coal Banks Landing, MT, to Fort Peck reservoir are sparse and discontinuous. Because the recreational and wildlife values of these stands are high, there are concerns about how flow alterations and cattle grazing may be limiting reproduction.

We have been measuring cottonwood seedling establishment and mortality at a set of 8 sites along the Missouri River for the last 5 years.

Results from this ongoing study suggest that (a) in most years large numbers of new seedlings occur in the bare, moist sites between the high flow line in early summer and the water's edge of late summer base flow; (b) seedling mortality in subsequent years is extremely high because of grazing, limited channel movement, and winter ice scour; and (c) successful recruitment is most likely when infrequent high flows have positioned seedlings high on the bank, when grazing intensity is low, and where local channel movement occurs.

BIO: Greg Auble is an riparian ecologist at the Midcontinent Ecological Science Center of USGS and has been working on the wild and scenic reach of Missouri River for more than 10 years.

Tuesday
June 26

Concurrent
Session 1A

Water
Allocation

9:00 a.m. -
10:20 a.m

CONCURRENT 1A

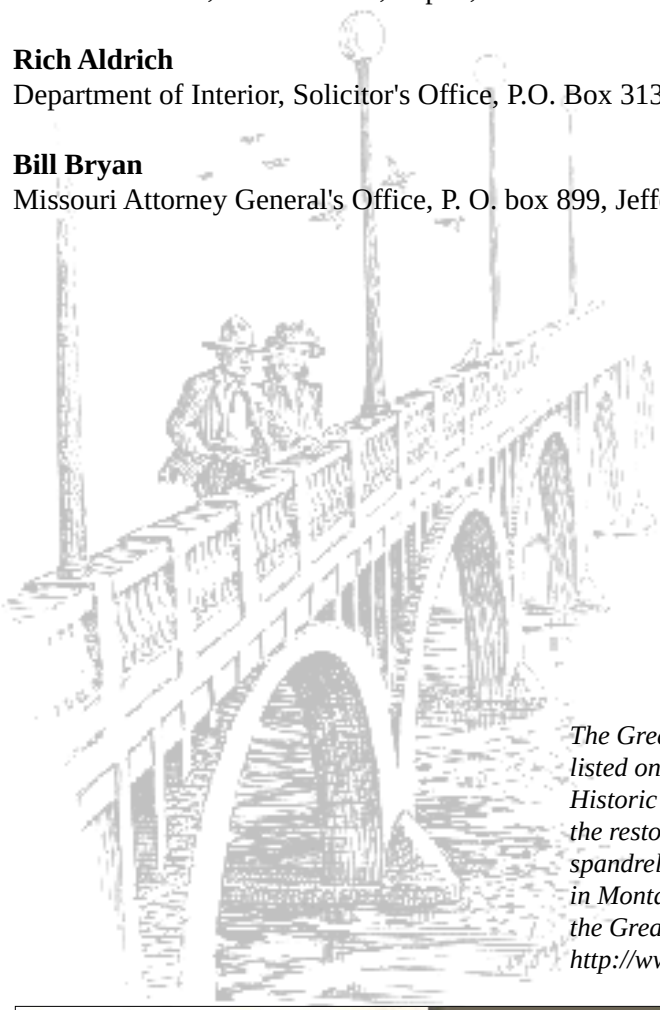
WATER ALLOCATION:
Compacting Process as a Way to Resolve Federal Reserved Water Rights in Montana

Susan Cottingham
Reserved Water Rights Compact Commission, P.O. Box 201601, Helena, MT 59620-1601

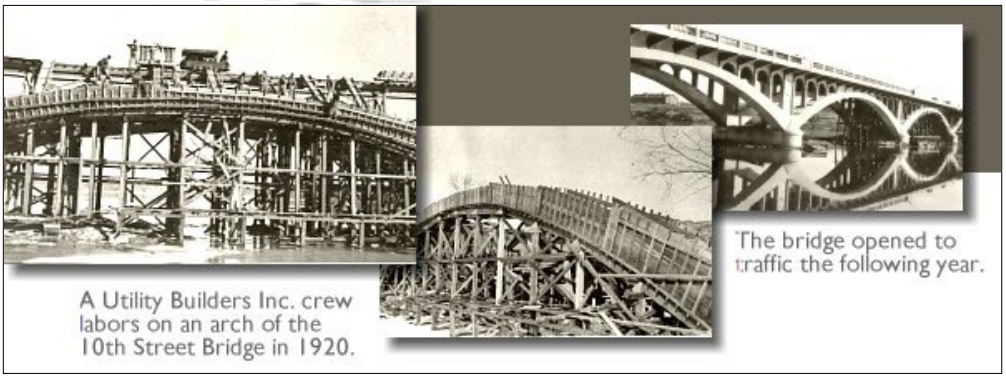
Caleb Shields
Fort Peck Tribes, P.O. Box 484, Poplar, MT 59255

Rich Aldrich
Department of Interior, Solicitor's Office, P.O. Box 31394, Billings, MT 59107-1394

Bill Bryan
Missouri Attorney General's Office, P. O. box 899, Jefferson City, MO 65102



The Great Falls 10th Street Bridge is listed on the National Register of Historic Places. Plans are ongoing for the restoration of this 1,130 feet open-spandrel, multi-arched bridge, the oldest in Montana and the longest of its type in the Great Plains states. http://www.montanas-archbridge.org/



CONCURRENT 1B

CURRENT TOPICS ON THE MISSOURI RIVER

Improving the Missouri River

Steve Mahfood
Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102-0176
nrmahfs@mail.dnr.state.mo.us

CO-AUTHORS: Mimi Garstang, John Drew and Robert R. Bacon, Missouri Department of Natural Resources, Jefferson City, MO

There are many changes currently occurring on the Missouri River, including the Corps of Engineers current review of new water control plan and the Fish and Wildlife Service declaring a jeopardy opinion for the threatened and endangered species. The Missouri Department of Natural Resources, as well as many other state and federal agencies, are actively involved in these changes. What does all this mean to the state of Missouri?

The Director of the Missouri Department of Natural Resources will cover many of the triumphs and impasses our state has had along the way, on this odyssey in Missouri River management. He will highlight some of the future opportunities and shed light on some of the remaining issues yet to be addressed in our basin.

BIO: Steve Mahfood was appointed Director of the Missouri Department of Natural Resources in January 1998. In this capacity, he oversees the activities of the department's 2000 employees in five divisions: Environmental Quality, State Parks, Energy, Geology and Land Survey and Administrative Support, as well as the Environmental Improvement and Energy Resources Authority. He is responsible directly to the Governor for managing the department, developing and implementing policy to protect Missouri's environment, natural and cultural resources, drafting and monitoring legislation and developing the department's $300 million budget.

Instream Structural Modifications for Habitat Diversity on the Lower River

Michael Chapman
Corps of Engineers-Kansas City, 601 East 12th Street, Kansas City, MO 64106
michael.d.chapman@usace.army.mil

This presentation will discuss the Corps of Engineer's program of dike and revetment modifications to create additional aquatic habitat below Rulo, Nebraska. Discussion will focus on methods of "controlled erosion" of the banklines to expand the distance between banks. Examples will include Jameson Island, Plowboy Bend, and Marion Bottoms. The challenges of implementing this program will be presented.

BIO: Mike Chapman is a Civil Engineer-P.E. Operations Engineer for the Bank Stabilization and Navigation Project (4 years) below Rulo, Nebraska. He is in charge of maintenance of dikes and revetments. He works with navigators, landowners, and environmental interest to schedule maintenance programs.

Papers

Tuesday
June 26

Concurrent
Session 1B

Current Topics on the Missouri River
(continued)

9:00 a.m. -
10:20 a.m.

USGS Science on the Missouri River

Pamela Haverland
U.S. Geological Survey, 4200 New Haven Road, Columbia, MO 65201
pamela_haverland@usgs.gov

Scientific investigations along the Missouri River corridor have been documented since the Lewis and Clark expedition. The U.S. Geological Survey (USGS), along with many other agencies and organizations, has contributed to the body of knowledge attempting to understand how the Missouri River functions. Today, with proposed changes to the operation of the Missouri River system, science is the common ground from which management decisions can be evaluated.

The USGS has made the study of rivers a future science direction and is emphasizing an integrated science approach for the Missouri River in the beginning stages of this work. With this opportunity to focus on the Missouri River, it was time to consider past work on the Missouri River; discuss the science needs identified by users and managers of the Missouri River; and plan multi-disciplinary work to address complex issues.

USGS managers and scientists drafted a strategic plan for work on the Missouri River during the summer of 2000. The strategic plan provides the framework for coordination, implementation, and integration of USGS work on the Missouri River. A key component of the strategic plan was the development of a science plan. The science plan provides an approach and identifies the questions for USGS scientists to conduct the integrated hydrologic, biologic, geologic, and geographic science needed to resolve the natural resource management issues along the Missouri River corridor.

A workshop was held in October 2000 to provide a forum for building the foundation for the development of the USGS science plan. Over 50 USGS scientists and managers from across all USGS disciplines attended the workshop. A writing team has drafted a science plan that is in review. The draft science plan will be used to support budget initiatives and to guide an integrated science program within USGS that is focused on basic understanding and to help answer questions related to Missouri River management.

BIO: Pam Haverland is the Branch Chief of Information Technology at the US Geological Survey's Columbia Environmental Research Center, in Columbia, MO. She has been working on Missouri River projects over 20 years. Before joining federal service, she spent over 13 years working for the Fisheries Division of the Missouri Department of Conservation. Ms. Haverland has a BS in math with a minor in economics from Southwest Missouri State University and a MS in statistics from Oklahoma State University. She is past-president of the North Central Division of the American Fisheries Society.

Handling Uncertainty in Natural Resource Management Decisions: *Adaptive Ecosystem Management*

Tony Prato
Center for Agricultural, Resource and Environmental Systems (CARES) - University of Missouri, 130 Mumford Hall, Columbia, MO 652116200
PratoA@missouri.edu

Ecosystem management is challenging because of uncertainties regarding how natural ecosystems respond to management actions. In particular, ecological economic systems are characterized by strong (usually non-linear) interactions between the parts, complex feedback loops that make it difficult to distinguish cause from effect, and significant time and space lags, discontinuities, thresholds, and limits.

A popular approach for handling biophysical uncertainty in natural ecosystems is adaptive ecosystem management. The basic premise of this approach is that human interactions with nature, such as management actions, should be experimental because human understanding of nature is imperfect. Some ecologists maintain that adaptive management is the only logical approach under the circumstances of uncertainty and the continued accumulation of knowledge.

Adaptive ecosystem management treats management actions as experiments for acquiring information about ecological responses to those actions. Experimental results provide a basis for determining whether or not a particular management action results in an ecosystem state that is ecologically sustainable. Adaptive ecosystem management is not without problems. It is time consuming and expensive and can give faulty results when relevant variables are either ignored or not held constant.

The analytical framework needed to implement adaptive ecosystem management is not well developed. This paper proposes a two-stage method that allows natural resource managers to account for uncertainty in making natural resource management decisions. The method employs Bayes theorem and multiple attribute decision-making principles.

BIO: Tony Prato is Professor and Chair of the Department of Agricultural Economics, and Co-Director of the Center for Agricultural, Resource and Environmental Systems (CARES) at the University of Missouri-Columbia.

CONCURRENT 2A

Tuesday
June 26

Concurrent
Session 2A

Missouri River Water Quality

10:50 a.m. -
12:10 p.m.

MISSOURI RIVER WATER QUALITY

SESSION OVERVIEW:
After many years of public debate and interagency dialogue, the role and importance of endangered species protection in Missouri River management has become clearly established. There can be no doubt that future river management decisions will consider impacts to listed species as a central factor.

The status of Missouri River water quality, and how it fits in to the overall management picture, is less clearly understood by river managers and scientists.

The purpose of this panel session is to provide a brief overview of water quality issues on the Missouri River, and to get conference participants engaged in thinking about how water quality management will fit into the future adaptive management of the Missouri River.

Topics to be covered include:

- How designated uses of the Missouri River support communities, both human and aquatic;
- What we know (and don't know) about water quality problems on the Missouri River;
- The basic framework for protecting water quality and new developments in the Clean Water Act affecting Missouri River uses;
- The unique challenges and concerns associated with interstate rivers;
- Approaches, shortcomings and challenges in monitoring water quality on large rivers;
- The relationship between water quality management and other management objectives, especially endangered species;
- A look at how other large river basin(s) are addressing these issues.

The Water Quality Framework

Karen Hamilton
U.S. Environmental Protection Agency, Region 8, Denver Place, 999 18th St., Suite 500, Denver, CO 80202-2466
hamilton.karen@epamail.epa.gov

The Clean Water Act and Safe Drinking Water Act provide a framework and tools for watershed restoration and protection. The presentation will describe how targeted parts of these legislations can be considered when developing watershed plans and actions. Ms. Hamilton will integrate the Endangered Species Act and endangered species management issues in the Upper Missouri River basin into the discussion of water quality concerns that can be addressed through these clean water statutes.

BIO: Karen Hamilton has been with the U.S. Environmental Protection Agency, Region 8, for 12 years with the Water Division and Ecosystems Protection Program. Currently, she manages two EPA teams: ground water and source water protection and the ecosystem stewardship team. Prior to that Ms. Hamilton acquired 12 years experience in aquatic resource management and research. She has a BS in Zoology and a MS in Fisheries Biology from Colorado State University and a secondary education degree from Northern Colorado University.

Water Quality Issues on the Missouri River in Montana

Art Compton (invited),
Montana Department of Environmental Quality

Water Quality Monitoring on Large Rivers

Tom Quinn
U.S. Geological Survey, 2617 E. Lincolnway, Ste B, Cheyenne, WY 82001 tlquinn@usgs.gov

The session will describe water quality monitoring approaches for large rivers such as fixed station monitoring, probabilistic approach, biomonitoring, etc. and existing programs such as NASQAN, NAWQA, EMAP. Unique challenges of monitoring large rivers and future directions in monitoring will be described.

BIO: Thomas L. Quinn is currently Chief of the U. S. Geological Survey's National Water Quality Assessment Program for the Yellowstone River Basin and serves as section chief for the Hydrologic Investigations Section of the USGS Water Resources office in Cheyenne, WY. He is responsible for implementing the large scale study of water quality in the Yellowstone River Basin and overall management and supervision of a number of other multi-disciplinary hydrologic studies.

Integrating Water Quality with Other River Management Objectives

Tim Stearns
Northwestern Natural Resource Center, National Wildlife Federation

Paper

Tuesday
June 26

Session 2B

Missouri River History

10:50 a.m. - 12:10 p.m.

CONCURRENT 2B

MISSOURI RIVER HISTORY

Was the Lewis and Clark Missouri River a Sinuous Ditch?

John LaRandeau
U.S. Army Corps of Engineers, Northwestern Division, 12565 West Center Road, Omaha, NE 68144-3869
john.r.larandeau@nwd01.usace.army.mil

Many visionaries have dreamed of the return of the Missouri River to the river of Lewis and Clark. However the images of what the Lewis and Clark River was like are often distorted. Later surveys and the Corps survey maps of 1890 have been suggested by some as representations of a natural river. Some assume these later river surveys are a model of the Lewis and Clark River. Others also suggest river photos taken of the Missouri River within the two National Recreation River reaches as representative of the Lewis and Clark River.

This discussion will describe the Missouri River through the eyes of Lewis and Clark and suggest that their river was a sinuous ditch. It was because of human interference of steamboating and farming after their great journey that the river was changed unnaturally to forms that are erroneously used as natural models. Then the Corps involvement to build a ditch below Ponca, Nebraska to the mouth will be shared.

The discussion will end with a recommendation that if we are going to systematically change the river back to a Lewis and Clark-like river we need to use their journal drawings and descriptions as well as other descriptions before 1820.

BIO: John LaRandeau is a Civil Engineer with the Corps of Engineers Northwestern Division. The Division headquarters is in Portland, OR however, Mr. LaRandeau's office is located in Omaha. He provides support to the Division's five Corps District Offices for Operations and Maintenance of the Corps navigation and flood control infrastructure within the Missouri and Columbia River basins.

Lewis and Clark Natural History

Richard Terra
Upper Missouri Breaks Audubon, 2101 4th Ave. South, Great Falls, MT 59405
richard terra@fps.k12.mt.us

Meriwether Lewis was given instructions by President Thomas Jefferson to study the flora and fauna he might encounter during the expedition of 1804. This presentation will focus on the animals and birds encountered and/or discovered by the expedition in Montana.

The project was developed because it is one aspect of the expedition which is interesting to children. It includes lecture and pictures and is adaptable to almost any age level of children or adults. Another interesting and valuable part of the project is field experience, which includes taking the participants out to some of the sites mentioned in the Lewis and Clark journals.

BIO: Richard Terra is an educator with Great Falls Public Schools. He has trained teachers in the natural history of the Lewis and Clark expedition, presented to students in the classroom, and conducted student workshops.

The Impact of Fuel Wood Cutting on Upper Missouri River Cottonwoods during the Steamship Era

Michael Merigliano
School of Forestry, University of Montana, Science Complex 449, Missoula, MT 59812 mmerig@selway.umt.edu

From 1860 to 1890, there were approximately 400 trips to Fort Benton, Montana by steamships. These boats used wood for fuel, and their impact on the forest has been little explored. To travel the Missouri River reaches above the Musselshell River, travel logs indicate that a steamship would use between 12 and 15 cords of wood per day, and cottonwood fulfilled about 70 percent of the total fuel requirement. For the first few years, wood harvesting was opportunistic and dead, dry wood was apparently plentiful and well-distributed along the travel route.

From about 1865 on, a small industry of wood cutters, called “woodhawks,” operated especially for the steamship enterprise. Woodhawks reduced the time steamships would have to spend gathering wood, but extended the wood cutting impact away from the flood plain in areas of sparse timber, and concentrated in densely-timbered areas. Considering all of the trips with an average of 15 cords per day consumption per boat, about 84,000 cords of cottonwood were harvested. Assuming a stocking rate of 4200 cubic feet of cottonwood per acre, about 1600 acres would have been harvested during the steamship era. This is about 15 percent of the present-day forest.

Lewis and Clark describe a generally sparse cottonwood forest along the Missouri River above the Musselshell River, and photographs from the early 1900's show a forest cover similar to today’s. Thus, the impact of fuel wood harvesting was likely moderate, and the forest had probably recovered to its pre-settlement extent by the mid-1900's.

BIO: Mike Merigliano is a research plant ecologist specializing in riparian areas.

Great Falls (Ryan Dam)

Tuesday
June 26

Concurrent
Session 2B

Missouri River History
(continued)

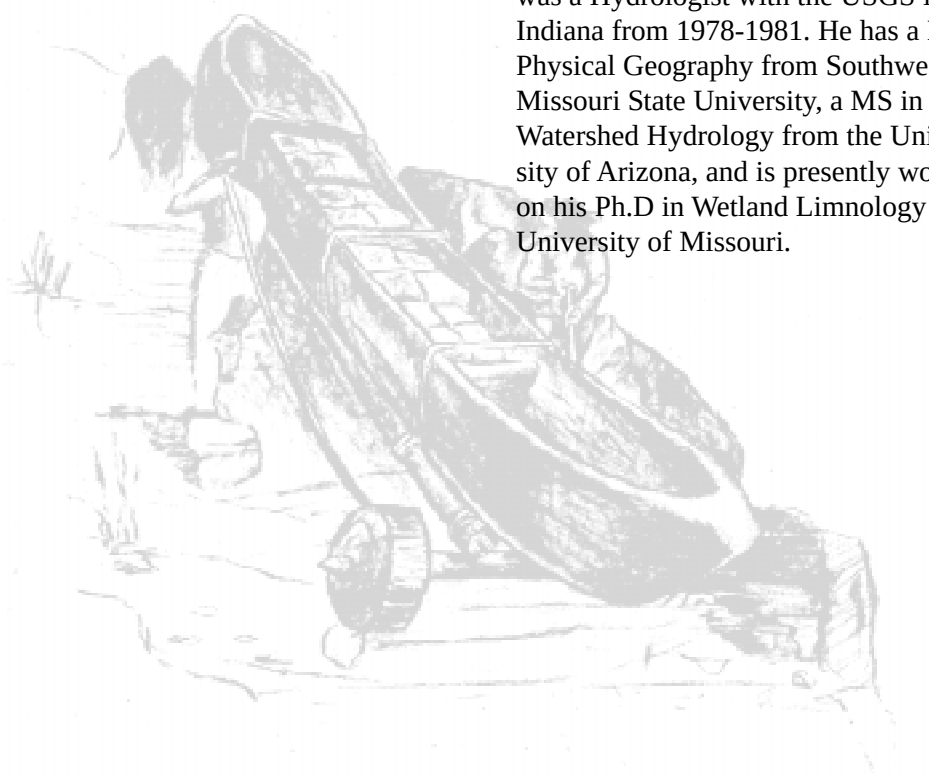
10:50 a.m. -
12:10 p.m.

Changes Through Time: A USGS Science Plan for the Lewis and Clark Bicentennial

Dale Blevins
U.S. Geological Survey, Room 221, 301 W. Lexington, Independence, MO 64050
dblevins@usgs.gov

The U.S. Geological Survey is planning to undertake a multidisciplinary science program designed to provide a scientific basis for resource management decisions along the route of the Lewis and Clark Expedition. The route includes three of the largest and most controversial rivers in the United States: the Ohio, Missouri, and Columbia Rivers.

Two major goals of the scientific commemoration will be to document how and why natural features along the Lewis and Clark trail have changed in the 200 years since the expedition, and to identify key physical, chemical, geological, and biological processes (and their interactions) having the largest effects on human use and ecological functions of these large river corridors. The results will be developed into tools that will help natural resource planners and decision makers shape the character of large rivers during the next 200 years.



This multidisciplined program will include aquatic and terrestrial investigations of the rivers, their flood plains, and other nearby natural features observed and recorded by Lewis and Clark. Riverine studies will be conducted using a small flotilla of boats equipped for collection of flow-velocity, channel-bathymetry, water-quality, sediment, fish, invertebrate, and many other types of data. The flotilla will collect data on all three rivers during the bicentennial anniversary of each river.

The USGS Lewis and Clark program will communicate the need for science-based decision making to the public. Traveling and stationary museum exhibits, live webcasts of data-collection activities from the flotilla, websites, and scientific visualization products are planned to communicate the objectives, findings, and need for data and their interpretation. The USGS Lewis and Clark Science Program is intended to provide a permanent science legacy that will be useful to the public and resource managers for decades.

BIO: Dale Blevins has been Chief Hydrologist of the U.S. Geological Survey, Independence, Missouri Subdistrict Office since 1992. Prior to that he was a Hydrologist with the USGS in Indiana from 1978-1981. He has a BS in Physical Geography from Southwest Missouri State University, a MS in Watershed Hydrology from the University of Arizona, and is presently working on his Ph.D in Wetland Limnology at the University of Missouri.

Wednesday June 27

Concurrent Session 3A

River Research and Monitoring

8:00 a.m. - 9:40 a.m.

CONCURRENT 3A:

RIVER RESEARCH AND MONITORING

Sauger Surveys on the Lower Yellowstone River

Brad Schmitz
Montana Department of Fish, Wildlife, and Parks, P.O. Box 1630, Miles City, MT 59301 Brschmitz@state.mt.us

A recent status review of sauger (Stizostedon canadense) in Montana waters indicated a decline in abundance relative to their historic distribution. Causes for this decline appear to include water allocation and management, irrigation diversions, and species interactions. Management surveys of Yellowstone River sauger populations are highly variable primarily due to the migratory nature of the fish, limited access to the river and sampling methods available.

Results of surveys indicate that population abundance continues to remain low but population structure is acceptable. Efforts to improve sauger status in the Lower Yellowstone River is focused on habitat restoration, reducing entrainment and passage impediments related to irrigation structures, improving knowledge of sauger life history and life history requirements within the system, and evaluating angler impacts. The ability to improve sauger populations in the Yellowstone River system is possible with cooperative efforts from resource users and agency coordination.

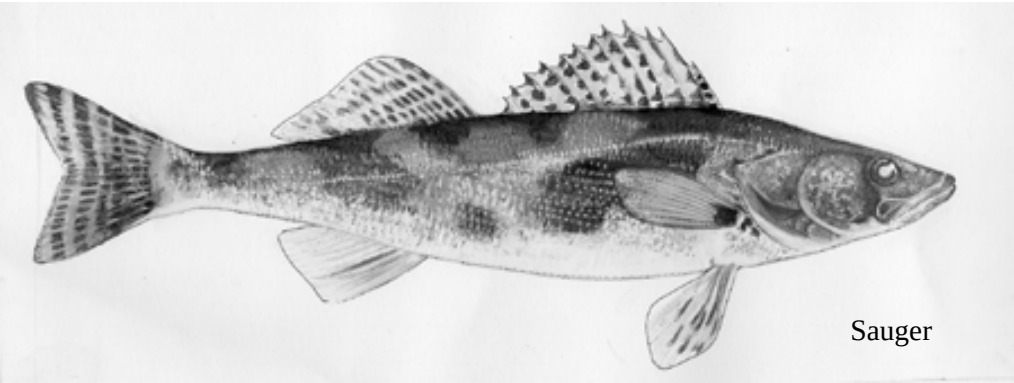
BIO: Brad Schmitz has worked for the Montana Department of Fish, Wildlife and Parks since 1998. Prior to that he worked as a Fisheries Biologist/Fish Manager for the Utah Division of Wildlife Management. He has a BS from Utah State University in Fish and Wildlife Management and a MS from Utah State University in Fisheries Management.

Potential Influence of Harvest on Shovelnose Sturgeon Populations in the Missouri and Yellowstone Rivers

Michael Quist

Kansas Cooperative Fish and Wildlife Research Unit, Kansas State University, 205 Leasure Hall, Manhatten, KS 66506 mcquist@ksu.edu

Collapse of the Asian and European caviar industry has raised concern about the future of shovelnose sturgeon (Scaphirhynchus platornchus) in the Missouri River. These concerns are warranted when we consider that sturgeons are highly vulnerable to human activities due to their unique reproduc-



Sauger

tive biology, longevity, and high susceptibility to harvest. Unfortunately, little is known about the potential harvest of shovelnose sturgeon and whether populations along the Missouri River system will respond similarly to fishing activities.

The purpose of this study was to determine the influence of harvest on size structure and yield under various minimum length limits (i.e., 400 mm, 510 mm) using a Beverton-Holt equilibrium yield model for populations in the Missouri (Missouri to Montana) and Yellowstone rivers.

In addition, we were also interested in determining the required exploitation to standardize yield from each population. Proportional stock density (PSD) and relative stock density of preferred-length fish (i.e., 510 mm; RSD-P) generally decreased with increased exploitation in all populations. A 400-mm minimum length limit had little advantage over no harvest regulations; however, a 510-mm length limit greatly increased RSD-P, especially at low natural and high fishing moralities. Without harvest regulations, yield-per-recruit declined dramatically once exploitation rates exceeded 20%, indicating that growth overfishing may occur without regulations. In general, a 400-mm minimum length limit provided the highest yield without growth overfishing. In order to reach a standardized yield of 80 kg per 1000 recruits, the required exploitation rates were 2 to 5 times higher in the Lower Missouri River than in the upper portion of the river.

These results suggest that harvest regulations may benefit shovelnose sturgeon. Future research should focus on the reproductive biology and recruitment of shovelnose sturgeon to provide a clearer picture of the potential influence of harvest on population dynamics.

BIO: Michael Quist is currently a Ph. D. student at Kansas State University, studying reservoir systems, but continuing research on shovelnose sturgeon and large river ecology. He has a BS from the University of Idaho and a MS from Kansas State University where he studied the influence of disturbance on stream fish communities. He also conducted numerous studies on shovelnose sturgeon (population characteristics, standard weight equation and length categories, overwinter habitat use) and large river ecology (shovelnose sturgeon research as well as channel catfish studies).

Overview of Status and Restoration Strategies of Westslope Cutthroat Trout in Northcentral Montana

Anne Tews
Montana Department of Fish, Wildlife and Parks, P.O. Box 938, Lewistown, MT 59457 antews@state.mt.us

CO-AUTHOR: Michael Enk, USDA Forest Service, Lewis and Clark National Forest, Great Falls, MT 59403

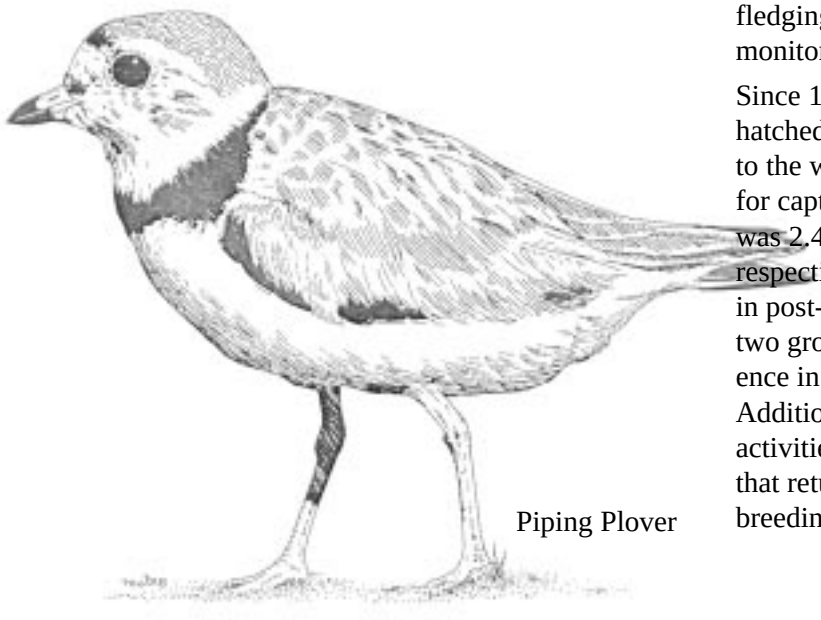
Westslope cutthroat trout (WCT) were likely the only trout in over 4000 stream and river miles in northcentral Montana when first described by Lewis and Clark in 1805. WCT appear to have experienced an abrupt and drastic decline early in the 20th century. This decline coincided with stocking of non-native rainbow trout, brook trout and brown trout. By the 1950's, non-native salmonids had colonized most of the cold-water fish habitat in the Missouri drainage and WCT were limited to small headwater populations. Over-fishing and habitat loss due to mining, irrigation, grazing, road building and logging also contributed to their decline.

Surveys in the past 10 years indicate that genetically pure WCT are now confined to about 5% of their historical range. Most remaining pure WCT populations

in northcentral Montana are protected from non-native trout by barriers such as waterfalls and dewatered channels. Restoration efforts began in the 1970's and have intensified in the last ten years. These efforts have included moving WCT to fishless headwater reaches to expand habitat, chemical treatment to remove introduced trout species and building barriers to prevent invasion from downstream non-native trout. Relocations in the last ten years have increased the number of river miles occupied by about 10%.

Tentative plans are to maintain existing WCT populations and to expand the current distribution by as much as a few hundred miles in this area. It is doubtful that WCT will ever have secure habitat in more than 10-20% of their original range in this region.

BIO: Anne Tews is a Fisheries Biologist with the Montana Department of Fish, Wildlife, and Parks. She has a BA in Biology from Lawrence University, Appleton, WI and a MS in Fish & Wildlife Management from Montana State University, Bozeman, MT.



Piping Plover

Is Captive Rearing a Successful Management Tool for Piping Plovers in the Great Plains?

Robyn Niver
U.S. Fish and Wildlife Service, South Dakota Ecological Services Field Office, 420 S. Garfield, Pierre, SD 57501 robyn_niver@fws.gov

CO-AUTHORS: R. Scott Lutz, Casey D. Kruse, and Nell McPhillips

Between 1995-97, record amounts of water flowed through the Missouri River system, inundating piping plovers (Charadrius melodus) and Interior least terns (Sterna antillarum) nesting habitat. The U.S. Army Corps of Engineers (USACE) initiated a captive-rearing program for both species, as hundreds of eggs were at risk of washing away with the rising waters.

We initiated a study in 1998 to evaluate the piping plover captive-rearing program. We evaluated survival and behaviors of captive- and wild-reared chicks during the pre- and post-release periods. We kept piping plovers in captivity until approximately 35-45 days, attached radio transmitters to their backs, and released them. We also captured wild-reared plovers at fledging, attached transmitters, and monitored their survival.

Since 1995, 482 eggs were reared, 382 hatched, and 360 were released back to the wild. The average fledge ratio for captive- and wild-reared plovers was 2.48 and 0.62 chicks per pair, respectively. We found no difference in post-release survival between the two groups. We also found no difference in post-release behaviors. Additionally, we observed breeding activities by six captive-reared plovers that returned to the Great Plains breeding grounds.

While captive rearing appeared to be highly successful, I caution relying on these efforts for the recovery of the Great Plains population of piping plovers. Additional information on captive returns and breeding are necessary to truly evaluate its potential. Also, captive rearing alleviates proximate problems (eg., immediate flooding) but does not address the ultimate problems (eg., habitat availability) for piping plovers in the Great Plains.

BIO: Robyn Niver is biologist with the U.S. Fish and Wildlife Service. She received a MS in Wildlife Ecology from the University Wisconsin-Madison.

The Biodiversity of Non-avian Terrestrial Vertebrates on the Benedictine Bottoms (1995-2000)

Martin Simon
Department of Biology, Benedictine College, 1020 North 2nd Street, Atchison, KS 66002
mssimon@benedictine.edu

CO-AUTHORS: Daniel E. Bowen, Corey Schrick, Tom Wurtz, Nathan Bauer, Michael Nations, Michael Urban, Andrew Rogers, Department of Biology, Benedictine College, Atchison, KS

The U.S. Army Corps of Engineers has mitigated 943 ha. of flood plain habitat on the Lower Missouri River in Atchison County, Kansas, called the Benedictine Bottoms. Our goal is to quantify changes in the biodiversity of amphibians, reptiles, and mammals residing on the Bottoms as the mitigation efforts proceed.

Throughout the Spring and early Summer of 1994-2000, the presence of anuran species were determined by nocturnal calling surveys, pitfall trapping and specimen collection. Reptiles were observed during daylight hours. Every month 40-50 standard mammal traps were placed among seven transect sampling sites for three nights. Deer spotlight surveys were conducted on a six kilometer portion of elevated road surrounding the Bottoms during the months of October, November , and December. 13 species of anuran amphibians, 11 species of reptiles, and 23 species of mammals were trapped or observed on the Bottoms. Up to early 2000, an average of 38.5 Whitetail Deer were seen during each of the 20 surveys. 43% were does, 22% fawns, 7% mature bucks, 5% immature bucks, and the remaining 24% were unclassified.

Sampling data indicate that seasonality, microhabitat, climatic conditions, and land use play a significant role in explaining variability in vertebrate biodiversity on the Benedictine Bottoms. Comparisons with a nearby undisturbed flood plain habitat in Leavenworth, Kansas, revealed a high frequency of amphibian, reptile, and mammal species in common. This work was supported in part by the Kansas Department of Wildlife and Parks, and the Benedictine College Discovery Program.

BIO: Martin Simon is a Professor of Biology at Benedictine Bottoms where he is the Projector Director for the Benedictine Bottoms Missouri River Biodiversity Assessment Program. He received his Ph.D from the University of California.

Wednesday, June 27

Concurrent Session 3B

Conservation Strategies

8:00 a.m. - 9:40 a.m.

CONCURRENT 3B:

CONSERVATION STRATEGIES

Conservation of a Missouri River Tributary: *Working Across Private and Political Boundaries on the Teton*

Seth Wilson
University of Montana, 340 Woodford Street, Missoula, MT 59801
sethwil@selway.umt.edu

CO-AUTHOR: Alan Rollo, Coordinator, Teton River Watershed Group

Our presentation offers a unique look at a private-public partnership that is working innovatively to resolve natural resource conflicts in the Teton River watershed in north-central Montana. The Teton River is approximately 196 miles long and drains 1,308 square miles of primarily agricultural land along the east slope of the Rocky Mountains before emptying into the Missouri River near Fort Benton.

The Teton River Watershed Group (TRWG) is a grassroots effort that formed in 1994 to address concerns over declining water quantity and quality of the Teton River. Working across private land ownership and among state and federal agencies, the TRWG operates with a spirit of open discussion, group consensus, and a teamwork approach for project implementation. The group is a tangible example of an integrated management style that has reduced hierarchical decision-making among agency interests. This approach has earned the trust and participation of private landowners and achieved tangible conservation successes.

In our presentation we will offer analysis and discussion in the following areas:

1) The effectiveness of transboundary conservation and communication among multiple interests;

2) Volunteer water quality monitoring and educational outreach;

3) Watershed and riparian health—emphasizing invasive plant management and progressive methods of steam bank stabilization and,

4) Future challenges.

We conclude with some key lessons that have helped move the TRWG forward with the important goal of improving the overall health of the Missouri River ecosystem by working at the tributary scale.

BIO: Seth M. Wilson is a doctoral student and research ecologist from the University of Montana's School of Forestry. His research interests include large carnivore conservation, watershed conservation, and private land conservation.

Alan Rollo is a retired Air Force Electronic Engineer and has been involved in watershed conservation for the past 7 years. He currently serves as the Teton River Watershed Group's Coordinator.

Citizen Participation in River Management Issues

Steve Burdic
Missouri River Communities Network, 200 Old Business 63 South, Columbia, MO 65201 moriver@coin.org

CO-AUTHOR: Steve Johnson, Missouri River Communities Network, Columbia, MO

The presentation will describe how the Missouri River Communities Network (MRCN) is working to get citizens involved in the process of land management planning for the 18,000 acres of public land in the Manitou Bluffs Region of the Missouri River in Central Missouri. Projects include: public information meetings; steering committee work groups to discuss river issues; an annual river festival; a river clean up with volunteers; development of an education project with an excursion boat on the river; stormwater pollution public education and outreach project; regional planning for the Lewis and Clark Bicentennial; developing a coalition to design, fund, and build a rest area featuring the river, Lewis and Clark, and stormwater clean up themes.

BIO: Steve Burdic is the Executive Director of MRCN. Mr. Burdic spent three years as grants manager for the Missouri Department of Natural Resources, Division of Parks. He helped organize the Missouri State Recycling Association, and was the manager of resource recycling for the City of Springfield, Missouri.

Steve Johnson is the Project Manager for the Manitou Bluffs Project at MRCN. Mr. Johnson was Executive Director of the Neighborhood Housing Services of KC, MO for 5 years and Administrator of Housing for the City of Fort Worth, Texas for 6 years.

The Lower Platte River Corridor Alliance: *An Intergovernmental Cooperative Approach to Water Quality*

Gregory Fetterman
Lower Platte River Corridor Alliance, 3125 Portia Street, P.O. Box 83581, Lincoln, NE 685013581
greg@lpsnrd.org

A diverse set of land use, water quality and flood management variables have impacted the vitality of the lower Platte river corridor and prompted three contiguous Natural Resources Districts to seek a means of cooperatively addressing issues in this Missouri River tributary. The Lower Platte River Corridor Alliance was formed in 1997 under the auspices of an inter-local agreement to coordinate the cooperative efforts of three natural resources districts and six state agencies. The mission of the Lower Platte River Corridor Alliance is to foster the development and implementation of locally drawn strategies, actions and practices to protect and restore the vitality of the river's resources. Recent research projects funded by the Alliance have revealed that the quality of water available for the most rapidly growing region of Nebraska is affected by the local geology, hydrology and land use.

This paper illustrates the tools, techniques and mechanisms used by the Alliance to facilitate intergovernmental cooperation, promote a basin-wide view of water quality issues and prompt cooperative action on the part of numerous political subdivisions.

The tools and techniques consist of the creation of a local government committee and the use of studies, educational programs, media productions and research. These tools enable the Alliance to increase the understanding and

awareness of issues in the region and to develop strategies to mitigate water-quality problems. Better management practices are encouraged from the individual household, the farmer, small subdivisions, towns of all sizes, and counties with a basin approach to resolve issues in mind.

The political entities involved include U.S. Army Corps of Engineers, U.S. Geological Survey, USDA/Natural Resources Conservation Service, National Park Service, six Nebraska state agencies, University of Nebraska Cooperative Extension, three Natural Resources Districts, eight counties, three Utility Districts and several cities. Funding is obtained from a variety of resources including participating federal, state and local political subdivisions and agencies, and the Nebraska Environmental Trust Fund. Additional funding and support is being sought from the U.S. Environmental Protection Agency. Since establishing the Alliance cooperation among agencies has increased and basin wide remedies have been implemented by all levels of government including the individual citizen.

BIO: Gregory S. Fetterman is the Coordinator for the Lower Platte River Corridor Alliance. He previously served as the Assistant City Administrator of the City Of Waukee, Iowa and worked for various campaigns and non-profits organizations. He is currently working on a Masters in Community and Regional Planning at the University of Nebraska-Lincoln. He holds a Masters of Public Administration from Drake University and a BA in Political Science from Iowa State University.

Developing a Regional Conservation Strategy for the Upper Missouri River and the Northern Great Plains

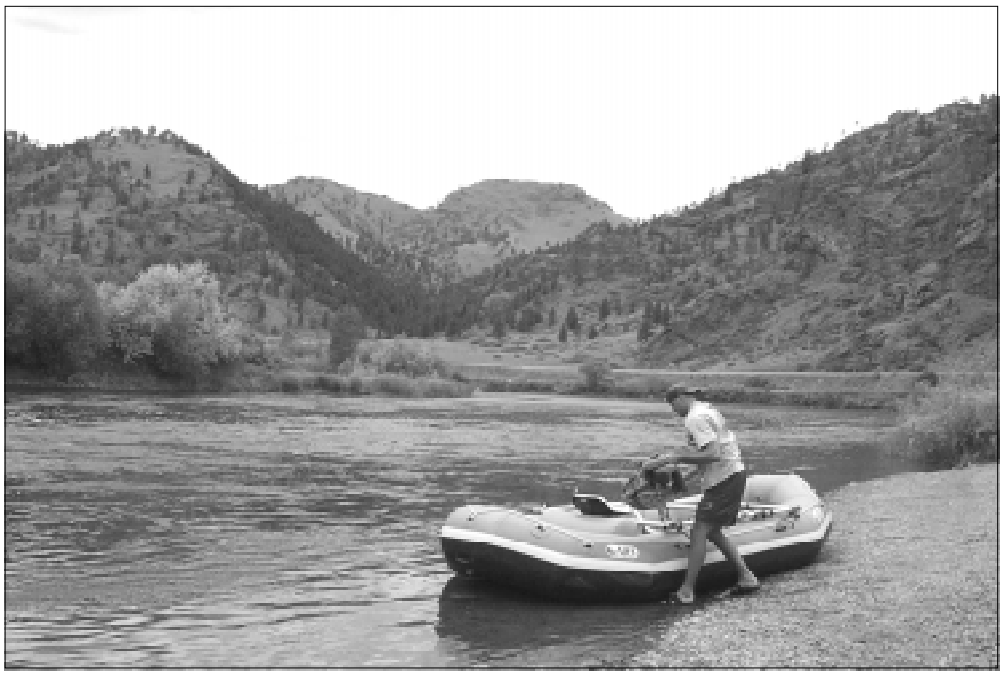
Mary Anne Peine
Great Plains Conservation Project/The Ecology Center, Inc., 801 Sherwood, Suite B, Missoula, MT 59802
peine@wildrockies.org

CO-AUTHORS: Kyran Kunkel, Turner Endangered Species Fund; Minette Johnson, Defenders of Wildlife; Jonathan Proctor, Predator Conservation Alliance

A panel of four individuals will discuss the development of a regional conservation strategy for the northern Great Plains, with a focus on the upper Missouri River country. The panelists are all members of the Great Plains Conservation Project, a coalition of fifteen organizations working to protect and restore the northern Great Plains ecosystem.

Specifically, the panel will focus on three aspects of conservation at the regional level in the northern Great Plains: public lands management (Jonathan Proctor, Predator Conservation Alliance), working with private landowners (Kyran Kunkel, Turner Endangered Species Fund), and tribal restoration efforts (Minette Johnson, Defenders of Wildlife).

The chair of the Great Plains Conservation Project (Mary Anne Peine, The Ecology Center) will then discuss efforts to consolidate these various facets within the context of a large regional conservation vision. As a focal point for the panel, all presenters will discuss the unique conservation values of the upper Missouri River country from a regional perspective.



Missouri River boating south of Great Falls.

Wednesday
June 27

Concurrent
Session 4A

River Research and Monitoring

10:10 a.m. - Noon

CONCURRENT 4A

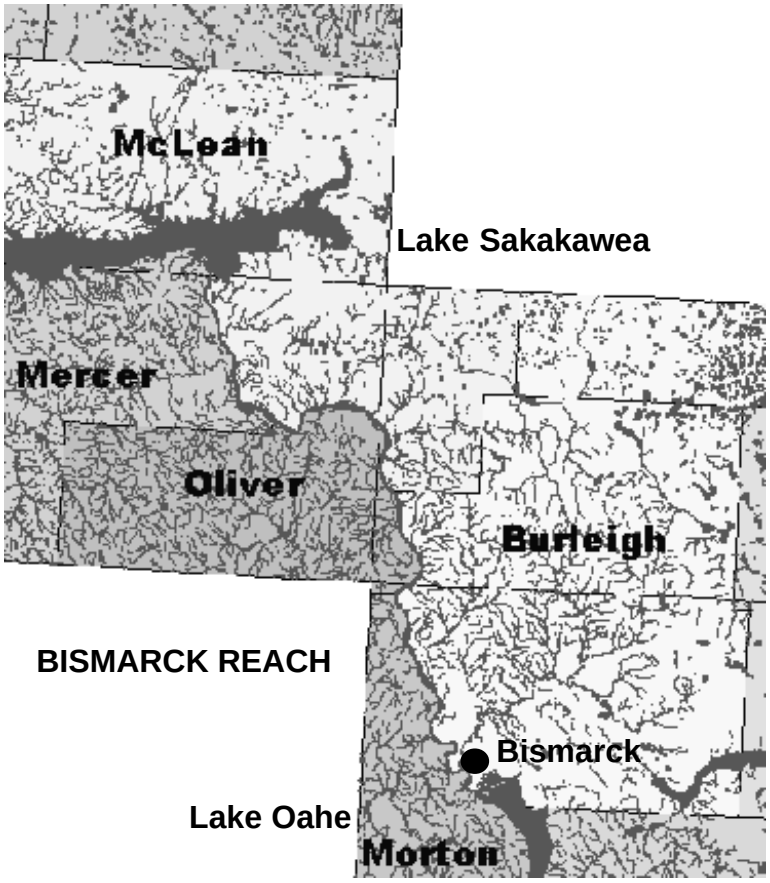
RIVER RESEARCH AND MONITORING

Upper Missouri River Environmental Monitoring and Assessment Program (EMAP-UMR):

2000 pilot study findings and future directions

David Bolgrein
UWEPA ORD Mid Continent Ecology Division, 6201 Congdon Blvd, Duluth, MN 55804 bolgrien.dave@epa.gov

CO-AUTHORS: Ted Angradi and Billy Schweiger, USEPA ORD MED, Denver, CO; Tim Corry, Jack Kelly, Sam Miller, Jill Scharold, Jo Thompson, and Corlis West, USEPA ORD MED, Duluth, MN



The EPA Office of Research and Development's (ORD) Mid-Continent Ecology Division has undertaken an EMAP study to assess the condition of selected resources of the Upper Missouri River mainstem (riverine) aquatic habitats, riparian habitats and reservoirs. In 2000, we completed pilot studies in the Garrison Reach and Lake Oahe to refine our sampling design, field protocols, and logistics.

Work in the mainstem aquatic habitats focused on identifying sources of variation among macrohabitat types (e.g., inside bends, secondary channels), testing sampling protocols for water, macrobenthos and habitat, and determining sample size requirements for representative sampling. Distinct differences between main channel and secondary channel habitats, and between deepwater and shoreline habitats were found. Our final mainstem aquatic sampling design will assess condition of the mainstem, including shoreline and deepwater habitats, and unconnected secondary channel habitats. Pilot efforts in riparian habitats focused on developing measures of canopy structure, understory plant species composition (including exotics) and human disturbance measures.

Results suggest that there is little relationship between these measures and aquatic macrohabitat type. These characteristics of riparian habitat are influenced by extant or historical (pre-dam) land-use, however. Our final design will produce an assessment of riparian condition focused on cottonwood dynamics, recruitment potential and successional status of floodplain forests.

Pilot efforts in Lake Oahe were focused on a synoptic limnological survey of the reservoir, including semi-continuous data acquisition using a towed sensor array, acoustic sediment classification, sediment sampling for macrobenthos, particle size, and organic carbon content, and water quality sampling. Sampling revealed higher algal fluorescence, macrobenthos abundance, and turbidity in the northern part of the lake compared

to the middle and southern parts, as well as from bays to offshore. Few systematic differences in trophic status were related to tributary inputs.

More sampling in the large tributaries will be done in 2001. Our final sampling program will yield estimates of lake-wide trophic status of plankton and benthos, sediment characteristics, and concentrations of nutrients, metals, and major ions. In 2001, we will return to the Garrison Reach and Lake Oahe to implement our assessment design. In 2002, we will apply the EMAP strategy in the Ft. Peck Reach and Lake Sakakawea.

BIO: EMAP-UMR Team Leader

Patterns of Larval Fish Abundance in Small (< 1ha) Backwaters of the Upper Missouri River Basin

Kipp Powell
South Dakota State University, Department of Wildlife and Fisheries Sciences, Box 2140B, NPB Room 138, Brookings, SD 57007-1696
powell_kipp@hotmail.com

CO-AUTHOR: Steven R. Chipps, South Dakota State University, Brookings, SD

Backwater habitats can provide important spawning and rearing areas for fish. To date little information exists on larval fish abundance and composition in backwaters of the free-flowing Garrison Reach of the Missouri River. In this study we present observations from the first year of a two-year study examining larval fishes in the Garrison Reach of the Missouri River.

In summer 2000 we sampled 12 small backwaters, to document larval fish abundance and composition. In addition we collected physical habitat, water quality and zooplankton data to explore factors affecting larval fish composition and abundance. Sediment core samples collected from each site are being used to estimate zooplankton production potential by hatching resting eggs in the laboratory. Here we report preliminary observations on factors associated with larval fish abundance in small Missouri River backwaters.

BIO: Kipp Powell is currently pursuing a Masters of Science at South Dakota State University. He obtained his BS from the University of Maine and spent three years working with the Maine Atlantic Salmon Commission.

Plant Communities of Temporarily and Seasonally Flooded Floodplain Wetlands in the Upper Missouri River Basin

Kent Werlin
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aquateer@hotmail.com

CO-AUTHOR: Daniel E. Hubbard, South Dakota State University, Brookings, SD

The condition and viability of flood plain wetlands in the Garrison Reach of the Upper Missouri River is largely unknown. To date, limited information has been collected on floodplain wetland plant communities on the Upper Missouri River. As part of a 2000/2001 pilot study for the EMAP Western Initiative, we attempt to characterize and quantify the vegetation communities of temporarily and seasonally flooded

flood plain wetlands in the Garrison Reach of the Upper Missouri River.

A total of 128 species of vascular plants were found during the first field season; of these, 27 were annuals and 99 are native to the region. A total of 102 species occurred in temporary (PEMA) wetlands with 33 occurring exclusively in temporary wetlands. These data will be compiled with chemical and biological characteristics of the same wetlands to facilitate the development of a multimetric indices of biotic integrity (IBI) for the Upper Missouri River floodplain wetlands. This IBI could be used to assess the biological condition of the flood plain wetlands in this reach and to establish baseline conditions for future monitoring efforts.

BIO: Kent Werlin is a Graduate Research Assistant with the Department of Wildlife and Fisheries Sciences, South Dakota State University. He received a BA in Environmental Studies from the University of Colorado.

Macroinvertebrate Composition in Seasonal Floodplain Wetlands of the Upper Missouri River Basin

Neil Haugerud
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njhaugerud@hotmail.com

CO-AUTHOR: Steven R. Chipps, South Dakota State University, Brookings, SD

Macroinvertebrate communities provide important information about the biological integrity of aquatic ecosystems. Although commonly used to assess integrity of streams and rivers, less is known about macroinvertebrate composition in seasonal (PEMC) flood plain wetlands. The purpose of this study is to develop a macroinvertebrate index of biotic integrity for flood plain wetlands of the Upper Missouri River Basin. In the first year of the study, six samples were obtained from each of three reference sites, two impaired sites, and five randomly selected sites. Samples were taken using a D-frame dip net and preserved in 90% ethanol.

Macroinvertebrates were identified to family, counted, and weighed for dry biomass. Preliminary findings revealed a total of 53 invertebrate taxa representing 48 families from 13 orders. Impaired sites contained a total of 36 families from 12 orders. In reference sites, we observed a total of 28 families from 7 orders. Tolerant taxa such as Culicidae, Chaoboridae, and Oligocheata were generally more abundant in impaired sites, whereas Odonata and Physidae were collected more frequently from reference sites.

Additional reference and impaired sites will be sampled in summer 2001 to develop invertebrate metrics that are useful for distinguishing between impaired and reference conditions

BIO: Neil Haugerud is a Graduate Research Assistant at South Dakota State University in Department of Wildlife and Fisheries Sciences. He received a BA from Gustavus Adolphus College.

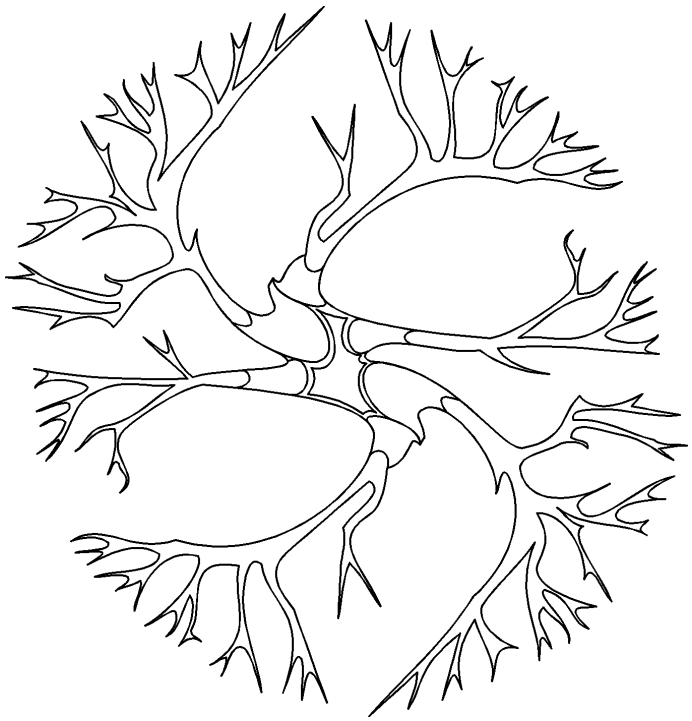
Effects of Riparian Vegetation on Water Volume and Aquatic Ecology of Central Great Plains Rivers

Tom Eddy
Emporia State University, Box 4050
Biology, Emporia, KS 668015087
eddytom@emporia.edu

This study assessed the effects of woody riparian vegetation on the volume of surface flows and the stream ecology of Missouri and Arkansas River tributaries in the Central Great Plains over the past decade. Acreage of woody riparian species in each of nine river basins in Central and Western Kansas was estimated by field studies, government forestry and soil survey data and aerial photographs. Composition of streamside woody vegetation in each river basin was determined by counts of species along 20 line transects set perpendicular to the stream. Water demands from evaporation and evapotranspiration was calculated from each river basin from hydrostatic lysimeter readings and evaporation pans. Four fish habitat conditions were compared on river stretches where woody riparian plants shaded the water with those stretches open to sunlight with grass and herbaceous plants on the stream banks.

Evapotranspiration from woody riparian vegetation in the nine river basins totaled 140,458 acre-ft/yr. Average annual evapotranspiration was 15,606 acre-ft/yr for the nine river basins. Woody riparian vegetation was dominated by cottonwood (63.3%) and willows (19.9%). Elms, green ash, saltcedar, shrubs and woody vines each contributed approximately 3.0% to the average composition of the riparian vegetation. The shaded river environments had significantly more escape habitat for fish, streamside insects, and benthic biomass. Water temperatures were lower in the shaded stretches. The study demonstrated the effects of woody riparian vegetation on water demand from surface flows and the benefits of streambank vegetation to fish habitat.

BIO: Tom Eddy is a plant ecologist whose interests are in grassland-woodland interfaces, especially in riparian zones. He teaches courses in biology at Emporia State University in Kansas.



Wednesday, June 27

Concurrent Session 4B

Water Quality

10:10 a.m. - Noon

CONCURRENT 4B

WATER QUALITY

Agriculture's Role in Water Quality Issues in the Missouri River Basin

Steve Mellis
University of Missouri Extension, 205 Agricultural Engineering, Columbia, MO 65211 melliss@missouri.edu

CO-AUTHOR: Lloyd Walker, Colorado State University, Ft. Collins, CO

Land use in the Missouri River basin is dominated by agricultural activities. Agricultural producers manage most of the private land in the basin. The agricultural economy is very diverse and includes irrigated, dryland, and rain fed crop production, rangeland and pasture for primarily cattle and sheep, and confined animal feeding operations of varying capacities. The agricultural sector represents a significant economic engine in the basin and this economic power often translates to political power in locally elected decision-making bodies.

Agriculture also has an impact on the environment of the Missouri River basin. Agriculture, by its nature, manipulates the environment for economically productive activities. Such an intimate interaction with the environment creates existing and potential effects (both good and bad) on the landscape. Often these effects are observed in the quality of the water resources and the modification of wildlife habitat. Adverse water quality effects may be the result of movement of agricultural chemicals (fertilizer and pesticides), sediment and animal manure by-products into the water resource. Habitat modification due to agriculture may be the result of draining wetlands, creating wetland and riparian habitat through irrigation practices, changing flow regime of water courses, modifying existing riparian areas, and creating and destroying habitat for a variety of wildlife. By its nature and scope, agriculture is the largest contributor to nonpoint source water pollution in the Missouri River basin.

Any program addressing water quality issues in the basin must engage agriculture. The United States Department of Agriculture (USDA) recognized the importance of engaging agriculture in such issues by funding a project entitled “Coordinated Agricultural Water Quality Programming for EPA Region 8.” This project coordinates the agricultural research and outreach programs of the Land Grant universities in the region in addressing agriculturally related water quality issues. Additionally, the Land-Grant universities in EPA Region 7 (the Lower Missouri River Basin) conduct similar programs and are collaborating in this effort. These universities working in partnership with other public and private agencies can deliver relevant quality outreach programs to residents of the basin.

This paper presentation will characterize the agriculture of the Missouri River basin, discuss it’s impact on water resources and outline methods of the Land-Grant university system to address water quality issues related to agriculture.

BIO: Steve Mellis joined the Water Quality Program with University Outreach and Extension in November of 1998, after spending time as an environmental consultant, Civil Engineering Project Manager in water and wastewater systems, owner of a construction com-

pany building custom homes and light commercial, construction engineer, and elementary and secondary school teacher. He is glad to be back in the area of environmental education, and looks forward to addressing issues effecting the waters of Missouri, which he has always loved. BSEd (Elementary and Biology), University of Missouri-Columbia; MSCE - University of Missouri-Columbia.

Lloyd Walker is the USDA Region 8 Agricultural Water Quality Program Coordinator. He is an Extension Engineering Specialist with Colorado State University Cooperative Extension in Fort Collins, CO.

Algal-nutrient Relations in the Yellowstone River during Low-flow Conditions

Stephen Porter
U.S. Geological Survey, Water Resources Division, Box 25046, MS406, DFC, Denver, CO 80225
sdporter@usgs.gov

CO-AUTHOR: David Peterson

Water quality and biological samples were collected during low flow conditions in August 2000 at 11 sites along the Yellowstone River, and near the mouths of two tributaries (Clarks Fork and Bighorn River), to assess algal-nutrient (eutrophication) relations with human and natural factors, and the influence of these factors on macroinvertebrate indicators of water quality.

Maximum rates of river productivity and respiration were estimated from diel monitoring of dissolved oxygen concentrations. Results from the study, part of the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program in the Yellowstone basin, indicate that the quality of the Yellowstone River generally is good to excellent. However, the middle segments of the river appear to be experiencing signs of accelerated eutrophication: nuisance growths of filamentous algae and relatively high rates of productivity and respiration.

The abundance and productivity of periphyton in the Yellowstone River increased downstream from tributary discharges, reflecting nutrient sources associated with irrigated agriculture and residential development in those basins. Concentrations of dissolved phosphorus were detected throughout the Yellowstone River, but were generally smaller at sites where periphyton productivity was high. Dissolved nitrate concentrations generally were less than laboratory reporting limits, and periphyton communities contained nitrogen-fixing species, which may indicate that the availability of dissolved nitrogen influences algal production in the upper and middle segments of the Yellowstone River. Concentrations of total nitrogen, phosphorus, and carbon increased with water turbidity in downstream segments of the Yellowstone River, where algal productivity was low and appeared to be limited by the availability of light.

BIO: Stephen Porter is Regional Biologist and algae specialist for the USGS NAWQA Program.
David Peterson (co-author) is an aquatic biologist with the Yellowstone River basin NAWQA Project.

Papers

Wednesday, June 27

Concurrent Session 4B

Water Quality (continued)

10:10 a.m. - Noon

Arsenic in Surface Water, Irrigated Soils and Groundwater of the Upper Missouri River Basin, Montana

Chuck Dalby
Montana Department of Natural Resources and Conservation, 48 North Last Chance Gulch, P.O. Box 201601, Helena, MT 59620-1601 cdalby@state.mt.us

Arsenic (As) from geothermal sources in Yellowstone National Park causes the upper Missouri River to frequently exceed state surface water (18µg) and federal drinking water (MCL--50µg) standards. This poses public health risks and limits future development of water resources.

In 1993, DNRC, in cooperation with USGS, MSU, UM and BOR, implemented a series of As investigations with these objectives:

1) Map (1:100,00) and statistically describe the occurrence of As in surface and shallow groundwater of the upper basin upstream from Canyon Ferry Reservoir (USGS);

2) Determine processes affecting As occurrence and mobility in irrigated Madison/ Missouri soils (MSU); explain the cause(s) of groundwater contamination in the lower Madison valley--Three Forks area (USGS);

3) Collect data to evaluate basin wide conservatism/reactivity of As transport in surface water and channel bed-sediments (USGS, UM); test a conservative surface-water transport model for the Madison/Missouri river upstream from Canyon Ferry Reservoir (DNRC,BOR).

Results show that significant groundwater contamination is limited to the lower Madison valley and is caused by a unique combination of hydrogeologic and geochemical factors, with irrigation playing a secondary role. Arsenic in surface water occurs as dissolved As(V) and, transport is largely conservative as demonstrated by the near equivalence of dissolved and total-recoverable As concentrations, the constancy of As loads, and consistent ratios of As concentrations to conservative geothermal tracers. The occurrence of diagenetic cycling in reservoir sediments and diel cycling of As in the water column, does not appear to limit application of a conservative transport model.

BIO: Chuck Dalby has been a hydrologist with the Montana Department of Natural Resources and Conservation for the past 15 years. His professional interests include sediment transport, channel processes in gravel-bed rivers, and irrigation effects on water quality.

Variation of Physical and Chemical Concentrations in Water Quality of the Lower Musselshell River

O'Brien Hollow
University of Montana, Room 207, School of Forestry, Missoula, MT 59802 grsshpr@selway.umt.edu

Local residents of the Lower Musselshell River formed the Musselshell River Watershed Group in 1998 to address common water quality and resource concerns. Their interest and concern in their livelihood and the health of the river were the impetus for this study. Water quality analysis was performed on the Lower Musselshell River during the 1999 and 2000 field seasons. The parameters measured were: total dissolved solids, total suspended sediments, total nutrients, fecal coliform, and periphyton. Previous water quality monitoring was performed by the Montana Department of Environmental Quality (1979-1999) and the U. S. Geological Survey (1974- present).

The combined water quality data has been used to determine trends in seasonal

variations of the aforementioned parameters. This data has been analyzed to determine the affects of flood irrigation and varying sources of stream flow: base flow, storm-runoff and snow melt, on the water quality parameters. Studies by the U. S. Geological Survey and the Natural Resource Conservation Service, as well as other studies in the Midwest and Eastern Oregon, suggest that seasonal variation is normal for most water quality constituents. Their findings also suggest that different sources of stream flow vary in their respective concentrations of physical and chemical water quality parameters.

Conclusions from the findings of this proposal will benefit local and regional knowledge of water quality issues along the Lower Musselshell River and effectively describe some of the reasons and variables involved in the variation of selected water quality parameters.

BIO: O'Brien Hollow was raised in Helena, Montana. He is working towards a Master's Degree at the University of Montana. His emphasis is surface water quality and human interaction. The best part of his work has been the myriad of conversations he has had with citizens of the Musselshell River; from grade school students to fourth generation livestock operators.

Rainbow Falls (Rainbow Dam)

Wednesday
June 27

Luncheon Presentations

Noon

Conference Wrap-Up

Missouri River Science: Looking Ahead

Dr. Charles (Chip) Groat

Dr. Groat is the 13th Director of the U.S. Geological Survey, U.S. Department of the Interior. Dr. Groat is a distinguished professional in the earth science community with over 25 years of direct involvement in geological studies, energy and minerals resource assessment, ground-water occurrence and protection, geomorphic processes and landform evolution in desert areas, and coastal studies.

http://www.usgs.gov/

One Day 80 Million Years Ago

Dr. Jack Horner

Dr. Horner, whose discoveries revolutionized the study of dinosaurs, is the Curator of Paleontology at the Museum of the Rockies in Bozeman. He plans to speak on cool new dinosaur research in Montana.

Dr. Horner's dinosaur research is located near Choteau, MT, popularly known as "Egg Mountain." This site was used as a nesting colony by at least three dinosaur species during the Late Cretaceous period. At the museum, full-sized recreations of these dinosaurs illustrate their behaviors, especially the now widely accepted theory of maternal nurturing by Maiasaura peeblesorum, or "good mother lizard" discovered and named by Dr. Horner.

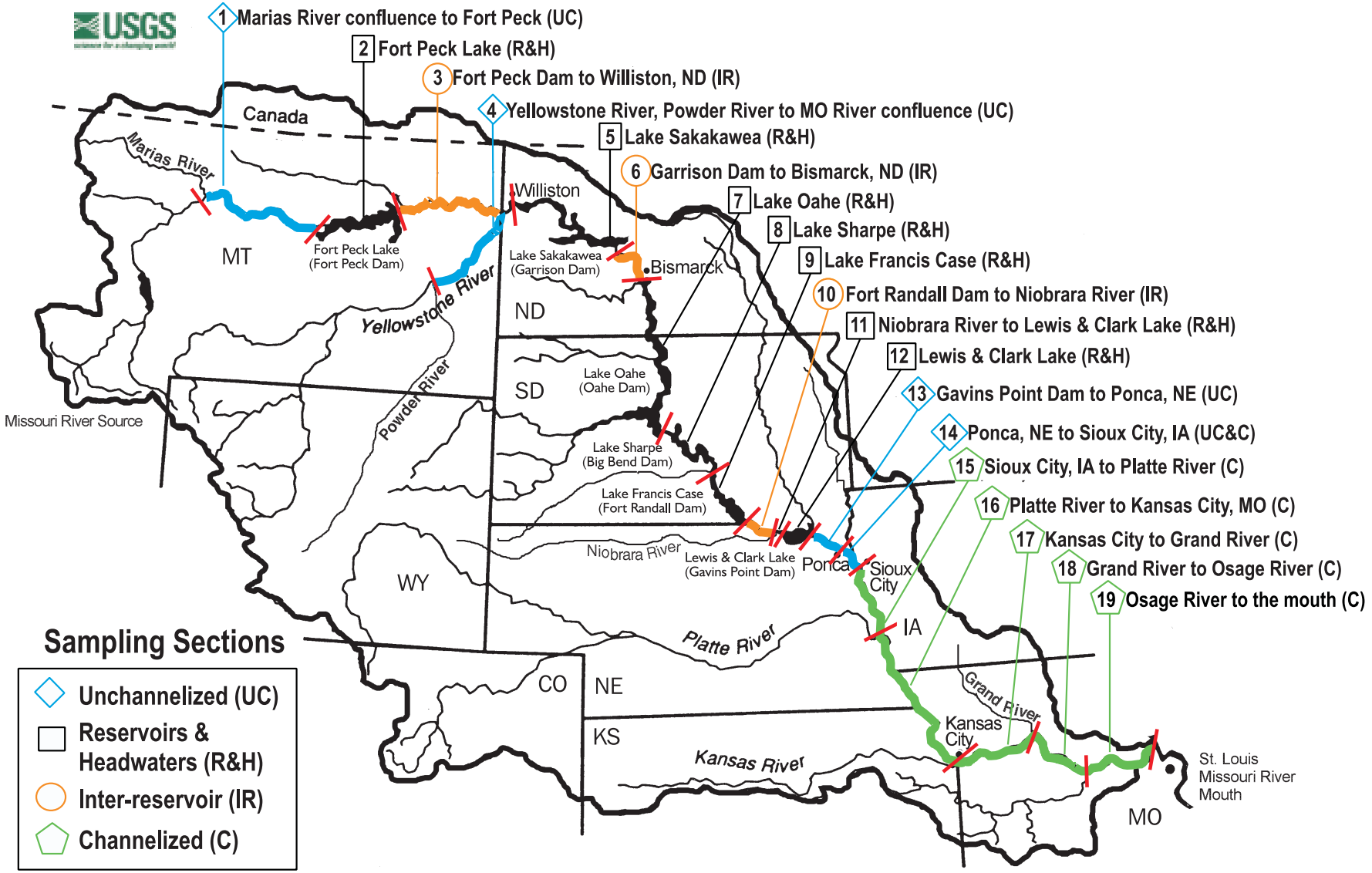
http://museum.montana.edu/

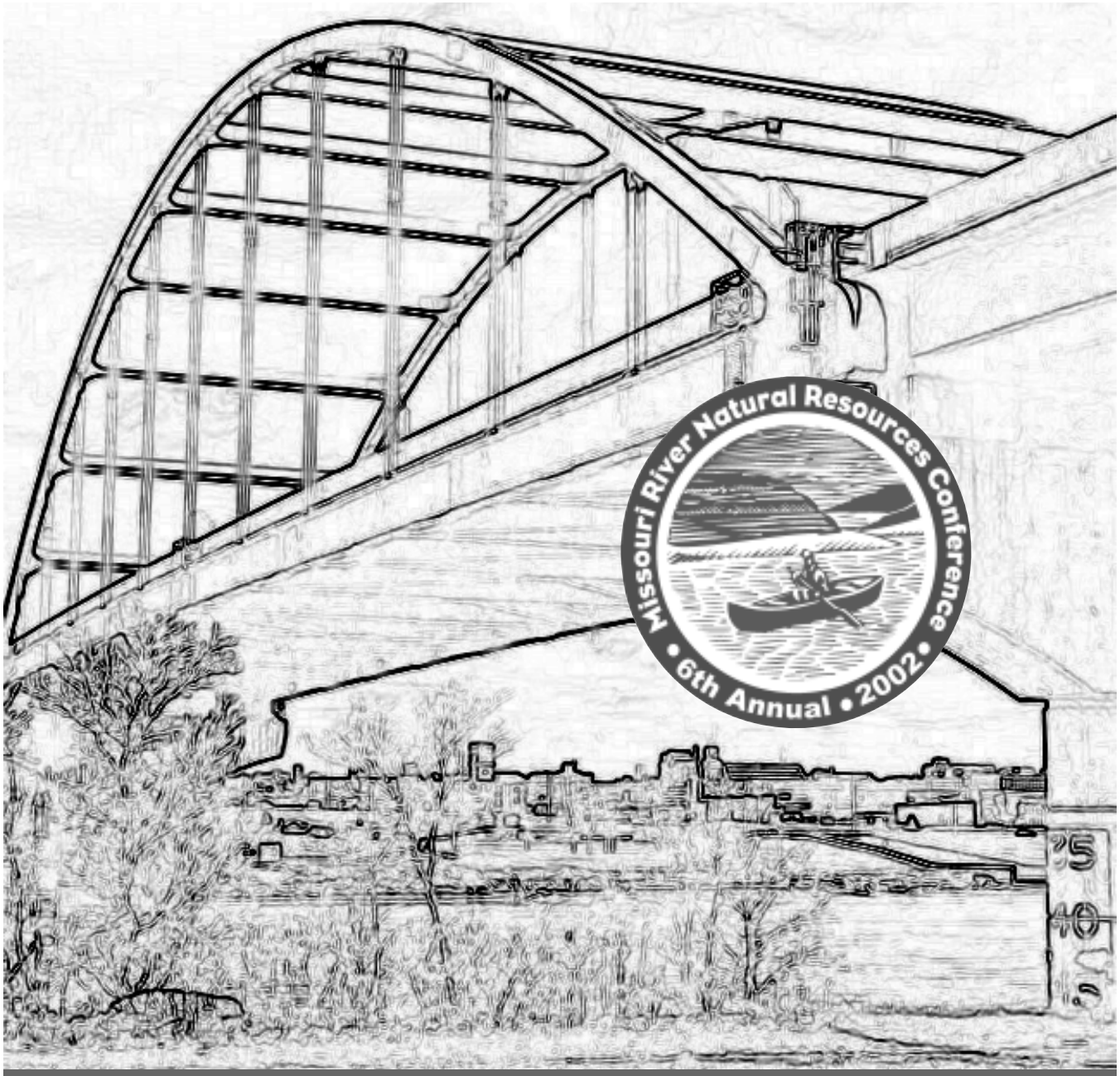
http://museumoftherockies.org/

Notes

Notes

Missouri River Environmental Assessment Program
Proposed Sampling Segments





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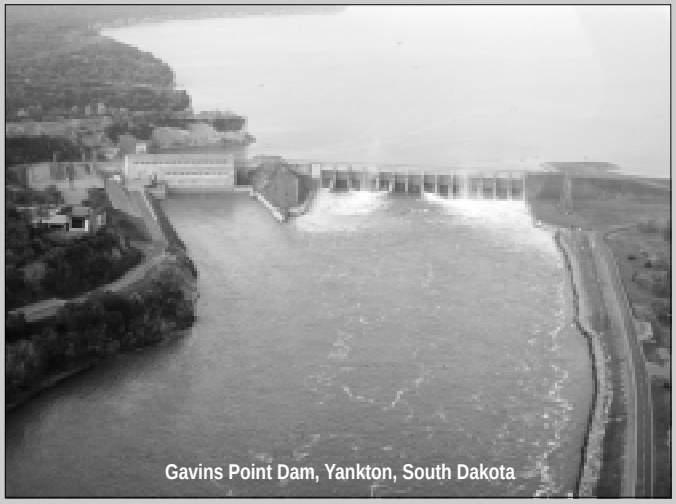

Gavins Point Dam, Yankton, South Dakota

Ponca State Park, Ponca, Nebraska

The Marina Inn is located on the Missouri River. North of Sioux City, the Missouri National Recreational River (http://www.nps.gov/mnrr/) flows between Gavins Point Dam and Ponca State Park.